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EDITED BY

G. F. LAMB M.A. Lond.

EDITOR OF
"VALIANT DEEDS IN LIFE AND LITERATURE"
"UNITED STATES AND UNITED KINGDOM"

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PREFACE

THE blacker side of human activity is too much with us: war, the spread of disease, intolerance, unnecessary poverty, cruelty, ugliness, "man's inhumanity to man"—this melancholy story is being told every day by newspaper and by common experience. It is a good thing, therefore, sometimes to dwell on the story of man in finer mood.

In the following pages will be found tales of the human mind and spirit striving towards many and varied achievements. There are simple heroes of the life-boat service and of the sea. There are explorers urged on by will-power and determination to investigate the unknown, and thus add to the sum total of human knowledge; and mountaineers resolutely pitting themselves against Nature at her most formidable. There are doctors and scientists whose patience and persistence have conferred lasting benefits on mankind. There are men and women, such as Florence Nightingale, Father Damien, and Albert Schweitzer, who have devoted their lives to the relief of human suffering. There are such pioneers as the Wrights, whose inventive genius and steady labour have opened up new paths (rightly or wrongly trodden) to the human race; and Metcalf, who triumphed over one of the most severe of physical disabilities to blaze a trail in the history of road engineering. It seemed fitting, moreover, to include in these stories of man's endeavour the epic, told in the heat of battle, of a nation's struggle against an aggression aimed at destroying the civilized way of life, and the record of the efforts of two great national leaders to frame a charter which would give humanity some foundation on which to base its strivings towards a saner and better world.

These are plain tales—though sometimes exciting ones—of men and women who have laboured to achieve something worth while. There is no moral attached to any of them. But to read of great endeavours is sometimes the first step towards emulating them; and it may be that some who turn these pages will find themselves inspired to be more than passive readers. They are much to be envied.

G. F. L.

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SALVAGE IN MID-ATLANTIC

THE merchant seaman is not very much in the public eye. We are apt to forget the courage and seamanship which his daily work demands. But now and again an episode occurs which throws the spotlight on these qualities. Such an episode was the affair of M.V. *San Demetrio* in 1940.

San Demetrio was an oil-tanker of 8000 tons, one of a convoy which was being shepherded across the Atlantic by the armed merchant liner H.M.S. *Jervis Bay*. The convoy was attacked in the Atlantic by the German pocket-battleship *Von Scheer*, and in spite of the heroism of the crew of *Jervis Bay*, who sacrificed themselves to save the convoy, *San Demetrio* was badly damaged and set on fire by German shells. Her crew were forced to abandon ship. They pulled away from her as fast as they could, for she seemed in imminent danger of blowing up. After midnight the enemy ceased firing, doubtless considering that the blazing ship was no longer worth wasting shells upon.

During the night the ship's boats lost touch with each other, and *San Demetrio* drifted out of sight. Later, the boat in charge of the Second Officer, Mr Hawkins, encountered *San Demetrio* once more, still blazing. They decided to risk boarding her. With a handful of men they put out the fires, got her engines working, and sailed the derelict ship back to England.

The official account of this remarkable feat has been written by F. Tennyson Jesse, the well-known novelist.

As the late and sulky November dawn broke over the heaving waters, the first issue of biscuits and a dipper of water was made by Hawkins. Daylight showed an empty sea and sky. The only sign of life was some screaming gulls. But dawn, however livid, always holds some promise; and men, however terrible the situation they may be in, feel a lifting of the heart as the light grows.

They laboured on, keeping the boat's head to sea; and early in the forenoon a ship was sighted. Hope sprang up, and the men started shouting and hailing, and pulling harder than ever to get closer to the vessel, for the weather was too bad to put up a sail. Although it was still daylight, they burned flares to try and attract the ship's attention, but alas, she passed without seeing them. The orange-coloured smoke-signals now carried by every ship's life-boat and raft had not at that time been introduced.

It was a horrible disappointment, and the usual remarks were passed as to the men on board ship keeping their eyes in the backs of their heads, and even less likely parts of their anatomy.

Later that afternoon, a second vessel was sighted to windward, and they all started to pull, once more speculating about the identity of the ship, wondering whether she were one of the convoy or a stranger. The further away a ship is at sea, the more she seems to stand out of the water in a cliff-like mass and the bigger she looks. It is only quite close at hand that what has on the horizon seemed a big liner may prove to be a small merchant vessel.

As they drew near this floating mass, two things struck them. It was obvious that she was abandoned and drifting and that she was on fire.

Then something about her silhouette seemed familiar, and the bos'n, who before the attack had begun to repaint *San Demetrio* to make her smart for her homecoming, was the first to notice that the masts and funnel of this vessel were vermilion with red lead. He shouted her name, and then they all realized that they were looking at *San Demetrio*, still burning and helpless. She was drifting down towards them, and, presenting as she did a much greater surface to the wind, was drifting at a much faster rate than they could. She was not only blazing and pouring out sultry columns of smoke, but surrounded by what seemed an acreage of petrol lying on the waters that spread away from her. Clouds of murky smoke were pouring from her poop and amidships. She was down by the head, and at every roll cataracts of green water poured over both her well-decks.

The sea was running high, blots and patches of foam, leprous pale in the gathering dusk, were slipping past the life-boat's gunwales. The men in the life-boat had to be cautious about getting alongside, for the life-boat was of steel and had she knocked against the ship's plates, a spark might have been set up and ignited the petrol that lay over the waters, and sent ship and boat sky-high. Therefore it was decided to pass astern of her and keep on her weather side, lest she should come relentlessly crashing down on them when dark fell. Once again the men rowed hard, and cleared her stern. She leaned away from them and wallowed into the dusk.

They rigged a canvas shelter over the bows of the boat, a further issue of biscuits and water was made, and, for the first time, a little bully-beef. The crew was split into two watches, Mr Hawkins taking one and Mr Pollard the other, so that there might be some possibility of rest during the night; the watches argued among themselves whether to board the blazing vessel or not, provided she was still there in the morning. A helpless and burning ship with a cargo of oil is a sorry city of refuge, but so is a life-boat in a storm in the middle of the North Atlantic.

The weather became worse; torrential rainstorms added to the men's discomfort. Most of them were now suffering from cold and exposure, and weakened by perpetual sea-sickness. . . .

[When dawn broke the blazing ship had disappeared. But presently they sighted her again, put up the boat's sail, drew up with her, and boarded her.]

The first thing that had to be done was to try and get the life-boat up, for she represented their only chance of safety were it necessary once more to quit *San Demetrio*. The boat was banging about under the counter, and might be knocked to pieces against the great rudder—and these tankers have exceptionally big rudders. The top of this one, as *San Demetrio* was down by the head, was out of the water.

The Yank[1] now volunteered to go overboard with a lifeline attached to him. This he did, and had that lifeline parted, as well it might, there would have been no possibility of saving him. He scrambled into the boat and managed to work her along the ship's side until he got her under the starboard after-davits—a difficult job, for the seas were running heavily. He attempted to bail the boat out and square her up under the falls,[2] and then every one struggled to haul her up, and indeed did succeed in hoisting her half-way up *San Demetrio's* side. But she was too heavy and too full of water for them to be able to get her any farther. They could not manage to tip up one end and spill her, so they had to leave her hanging from the falls. There was no way of securing her, and about two o'clock that afternoon she broke adrift and was never seen again. . . .

The next thing to do, after hauling the life-boat up as far as she would go, was to start to extinguish the fires, one of which was still raging amidships above No. 7 port tank, and the other aft, in—ironically enough—the freezer. The Chief [Engineer] noticed that the insulation round the meat store aft was burning and sparking very violently.

---

[1] A Canadian-born member of the crew, named Preston

[2] The ropes of hoisting-tackle.

There was much to be done, for the sight presented by *San Demetrio* was not a heartening one. Fire had destroyed the poop, the after cabins on the port side, and the bridge amidships; the navigation bridge had been demolished by a direct hit; and Monkey Island—the deck-head over the wheel-house—was white-hot. All amidships was gutted by fire: the wireless, compasses, steering-gear, charts, and signalling flags had all gone.

The main deck plating, which was over the main cargo decks, was buckled and crumpled like cardboard, and riddled with shell holes. The shell which had been the first to hit the vessel on the port side of the fo'c'sle had burst in the forepeak, the splinters had pierced the collision bulkhead and the forehold was flooded. The pipeline, steam and exhaust lines, and all her deck fittings on the main deck were gone. The only accommodation left on board was on the starboard side aft. Elsewhere every cabin was gutted by fire and holed by splinters; not one scrap of her interior fittings remained, and with them had gone everyone's personal property and the presents a seaman invariably brings home. The Steward's stores, and other stores on the main deck below the midship accommodation, were completely gutted, and the fresh-water tanks amidships were destroyed, but luckily the two tanks aft were undamaged. It would have been possible to condense salt water, but it would not have tasted too sweet and would have taken time in the doing.

Every time the vessel rolled, petrol spouted out of the holes in her decks and ran into the lee scuppers, and smouldering debris was everywhere.

The Chief and Mr Willey, helped by Boyle and Davies, made a hurried splash into the engine-room: "Gee, what a hell of a mess!" breathed Mr Pollard. For from three to four feet of water had come up to the engine-room platform and the fuel units were under water. But, for his comforting, the lubricating and water-cooling systems were undamaged, and the main engines proved to be in working order, although everything was wet. A bucket and extinguisher party was formed on deck for the fires there, and while the deck crew worked at this the Chief and Mr Willey and their helpers, Davies and Boyle, went below and reassembled the Paxman generator so that electricity should once more be available to start the fuel-oil pump. . . .

Although it was impossible to work in the engine-room after dark that night, as no light could be shown, pumping operations were continued, and several times through the night the hose had to be played on the meat-room aft, which was very heavily insulated and had become the focal point of danger, for the cork insulation all round it was from ten to twelve inches thick, faced with cement and covered with steel outside. This cork insulation kept burning and sparking. In the meat-room a fire was burning, and the break of the poop[1] and the after well-deck were full of holes spouting oil. Every time the wind blew that way it caused the fire in the meat-room to blaze up, and it was not until daylight next morning that the Chief was able to chisel away the cork and cement insulation and get the fire-hose down behind it, so that there was no longer anything to keep on smouldering. That night, too, the engine-room was pumped dry of water, and soundings were taken of all double-bottom tanks. These soundings tallied with those taken before the attack, and showed she was not making water and had no damage below the water-line. Not much more could be done that night, but the pumps had to be kept under supervision so as to supply water to the deck, and the engine-room itself had to be perpetually pumped out. Next morning, all hands were employed plugging the holes in the deck with cottonwaste pegged into place with blocks shaped from soft wood.

---

[1] Aftermost and highest deck.

And at last, by about eight o'clock on the morning of Friday the 8th, it could be said that the danger from fire was mastered; every outbreak in the night had been extinguished; the cork insulation was sodden at last. It only remained to be seen that no naked flame was lit and no spark engendered in any manner.

Why, considering the low flash-point of *San Demetrio's* cargo, she had not exploded, will never be known for certain. . . .

Since the bridge had gone, it followed that all communication to the engine-room was out of action, so the Chief set to work to invent a method of signalling from the deck to the engine-room, and by an arrangement of lamps he succeeded in doing this. He fitted lights in a fore and aft direction. When the forward light went on it would signal "Go ahead"; a flickering light would mean "Increase speed"; the centre light meant "Stop"; and the after light meant "Go astern." Owing to a shortage of cable, these lights had to be erected high up in the engine-room, and to attract the attention of the men working there, a signal was given by the simple expedient of knocking on the skylight with a hammer. These ingenious and rather Heath Robinson arrangements worked perfectly.

To try and secure the life-boat had been, of course, the first thing; the next had been to extinguish the fires; the third, to get her engines in working order and the deck holes plugged so that she could be got under way. She was no longer ablaze, but she was rolling helplessly on the heavy and increasing seas.

It must be remembered that all her normal steering gear had gone. But even her auxiliary steering gear aft was partially destroyed. There was a small auxiliary wheel aft of which all but the hub, four spokes, and a bit of rim had been burned away. The wooden deck which supported this wheel had been burned also, and the Chief had blocks of wood cut and fitted to shore up the pedestal. The steering standard aft operates the steering engine by means of a series of shafts and bevel wheels in the steering engine flat below, but owing to the intense heat of the fire the bulkheads through which the shafting passed had become distorted, and these bulkheads had to be hammered out to free the shafts for action.

The binnacle was found, having dropped through two decks, but it was apparently undamaged save for a large and sinister bubble in the compass fluid, and was set up in its proper position again. At about 2 P.M. on the 8th the steering gear had been got ready, and the Chief then went below and tested his main engines both ahead and astern.

They kicked over sweetly, at about ninety revolutions per minute. So *San Demetrio's* engines were set going ahead at about half-past two on that grey and stormy afternoon. And when the helmsman laid his hands on the tiny auxiliary wheel with its four spokes, below in the engine-room flat the huge green-painted tiller that moves there, apparently without human agency, began to swing over obediently. For that little broken wheel was connected with the steering engine steam valves; they set the steering engine in motion; this in its turn pushed the great hydraulic rams, sleek and silent; the shafts revolved, the teeth of the bevel wheels engaged each other—all these moved because the endurance and the courage of man had informed what had been dead wood and metal with his unquenchable spirit.

F. TENNYSON JESSE, *The Saga of "San Demetrio"*

ALONE IN THE ATLANTIC

One of the most remarkable journeys in the history of sailing was made by a young Frenchman in 1922. In a little 40-foot yacht, the *Firecrest*, Alain Gerbault sailed alone from Gibraltar to New York—the first occasion on which the journey across the Atlantic had ever been made single-handed from east to west. (Owing to the prevailing westerly winds the journey in this direction is about 1500 miles longer than from west to east—4500 miles as opposed to 3000.)

Gerbault's voyage was inspired by the spirit of adventure and by love of the sea. Though it was difficult and at times dangerous for a sailor in so small a craft and without a companion, there was nothing foolhardy about his trip. He was an expert yachtsman and had equipped himself thoroughly for the voyage. A less efficient and less prepared traveller would almost certainly have perished. As it was, Gerbault on more than one occasion came near to disaster. The water in his casks went bad. The winds he encountered were quite unusual, and sent him off his course. Storms ripped his sails again and again, and kept him constantly at work repairing them. Heavy seas swept the *Firecrest* and soaked everything in the ship. On more than one occasion he suffered seriously from illness. But skill and determination kept him going. On September 15 he dropped anchor off Long Island, New York, just 101 days after leaving Gibraltar.

The story of his journey is a real epic of the sea, and an inspiring tale of grit and ability to meet the onslaughts of nature.

On August 18th the gales came on again; my sails began to rip; parts of the rigging broke under press of sail, and the leaping of the cutter added to my discomfort. The pump got out of order, too. The seas were also running high, and by night-time I was cold, wet, and tired, so took some quinine to ward off a chill.

The irony of it all was that after having been on short rations of water for a month I was now getting so much that I could not get rid of it. It was also impossible to keep the heavy seas and spray from coming through the sails with which I had plugged the sail-locker hatch.

The water had now risen to the level of the cabin floor, and when the *Firecrest* listed, it splashed around in the lockers and bunks, wetting and spoiling everything.

On deck it was blowing a regular hurricane. The sky was entirely obscured with thick clouds, hanging so low and thick that it seemed like night. I had to reef the mainsail down until nothing was showing but its peak, the jaws of the boom and gaff[1] being only four or five feet apart. The seas became so high and the boat laboured so heavily that it seemed at times as though she would jump the mast out of her. The rain, too, came in slanting torrents, driven before a stinging blast and almost blinding me. Facing it I could hardly open my eyes, and when I did I could hardly see from one end to the other.

For several days now I had been exposed to drenching rain and spray, the consequence being that the skin of my hands had become so soft that it was very painful to pull on the ropes.

Neither the baffling gales that ripped the sails and set the lockers awash nor exposure to drenching seas and cutting rains were sufficient to burn the sea-fever out of my veins. A man crossing the ocean alone must expect some distressing times. Sailormen of ancient times who rounded the Capes of Good Hope and Horn had to fight for their lives, and suffered more from cold and exposure. I had a feeling, too, that there was a pretty good chance that some day the *Firecrest* and I would encounter a storm that we should not weather.

---

[1] Boom across the upper part of the mainsail.

The gale continued throughout the night of the 19th of August. Sea after sea swept over the little cutter, and she shook and reeled under them. I was awakened often by the shock of the seas and the heavy listing of the boat.

It was a dirty-looking morning on the 20th, and the climax of all the gales that had gone before. It was the day, too, when the *Firecrest* came near to making the port of missing ships. As far as the eye could see there was nothing but an angry welter of water, overhung with a low-lying canopy of leaden, scurrying clouds, driving before the gale.

By ten o'clock the wind had increased to hurricane force. The seas ran short and viciously. Their curling crests racing before the thrust of the wind seemed to be torn into little whirlpools before they broke into a lather of soapy foam. These great seas bore down on the little cutter as though they were finally bent on her destruction. But she rose to them and fought her way through them in a way that made me want to sing a poem in her praise.

Then, in a moment, I seemed engulfed in disaster. The incident occurred just after noon. The *Firecrest* was sailing full and by, under a bit of her mainsail and jib. Suddenly I saw, towering on my limited horizon, a huge wave rearing its curling, snowy crest so high that it dwarfed all others I had ever seen. I could hardly believe my eyes. It was a thing of beauty as well as of awe as it came roaring down upon us.

Knowing that if I stayed on deck I would meet death by being washed overboard, I had just time to climb into the rigging, and was about half-way to the masthead when it burst upon the *Firecrest* in fury, burying her from my sight under tons of solid water and a lather of foam. The gallant little boat staggered and reeled under the blow, until I began to wonder anxiously whether she was going to founder or fight her way back to the surface.

Slowly she came out of the smother of it, and the great wave roared away to leeward. I slid down from my perch in the rigging to discover that it had broken off the outboard part of the bowsprit. Held by the jibstay, it lay in a maze of rigging and sail under the lee rail, where every sea used it as a battering-ram against the planking, threatening at every blow to stave a hole in the hull.

The mast was also swaying dangerously as the *Firecrest* rolled. Somehow the shrouds[1] had become loose at the masthead. There was now a fair prospect that the cutter would roll the mast out of her, even if the broken bowsprit failed to stave the hole it seemed trying for. The wind cut my face with stinging force, and the deck was, most of the time, awash with breaking seas.

But I was obliged to jump to work to save both boat and life. First I had to get the mainsail off her, and, in trying to do so, found the hurricane held the sail so hard against the lee topping lift[2] that I had to rig a purchase to haul it down with the downhaul; but I finally managed to get it stowed.

It proved a tremendous job to haul the wreckage aboard. The deck was like a slide, and the gale so violent that I had to crouch down in order to keep from being wrenched off the deck and hurled bodily into the sea. I clung desperately to the shrouds at intervals. The broken part of the bowsprit was terrifically heavy, and I had to lash a rope round it while it was tossing about and buffeting the side. Several times it nearly jerked me overboard.

At last I had the jib in, and the bowsprit safely lashed on deck; but it was nearly dusk, and I felt worn out. That whipping mast had, however, to be reckoned with, and I could take no rest till at least an attempt had been made to get it tight. So, going aloft on the shaking stick, and clinging to it as it swung from side to side, I speedily discovered that the racking which held the port shrouds in a sort of eye had given way.

---

[1] Ropes supporting the mast.

[2] Rope that supports the main boom when the mainsail is lowered.

Twice I was swung clear of the ship, still clinging to a rope, to be dashed back against the mast with a bang. After nearly losing my hold more than once I found that I was too exhausted to make repairs that night, so slid down to deck to find the whole boat vibrating from the shaking spar.

I feared the deck might soon be opened under the strain of it, so, to steady it, I hoisted a close-reefed trysail, and filled her away on the starboard tack, in order to let the starboard and undamaged shrouds take the strain. I then hauled the clew of the reefed staysail to windward, and hove to.

With this nursing she rode a little easier, and the slatting of the mast was not quite so severe. It was now nearly dark and the wind seemed to be moderating a little, so I went below to get supper.

But when I went to start a fire, neither of the two Primus stoves would work; so I had to turn in, hungry, cold, drenched, and exhausted, for the first time on the cruise sad, fagged out, and fed up.

At this point Bermuda lay only three hundred miles south, but New York at least one thousand miles away. I knew, too, that it would be good judgment to head for the islands and make repairs there before going on to New York; but I had set my heart on making the voyage from Gibraltar to the American coast without touching at any port, and to abandon that plan was heart-breaking.

So much did I feel upon this point that I should not have cared if a wave had swept over us and carried the *Firecrest* to the bottom of the sea. I tried vainly to sleep. The mast was still slatting about so hard that I feared it would either tear up the deck or carry it away. For some hours I stayed in my bunk, thinking the problem out with aching head, and then suddenly decided to try the seemingly impossible.

I got up again, and, as I needed food badly, began to work at the stoves. I filed down three sail needles and broke them, one after another, before I could get one small enough to clear the hole through which the kerosene was fed to the vaporizing burner. It was nearly dawn before I got the burner working, but I was then able to cook a breakfast of tea and bacon.

This dispatched, I began to feel ashamed of the indecisions of the night before. I felt ready for the battle again, and I determined to sail through thick and thin to New York, the goal of the trip.

On going on deck again I found that, though the gale had moderated a little, it was still blowing hard, and the sea tremendous.

The mast had to be steadied at all costs, and the damaged rigging repaired. It was hard to climb on the swinging stick, and it was harder to stay on it at all. With legs around the crosstrees I had to work head downwards. In that position it took me more than an hour to put a racking seizing round the two shrouds where they came close together at the masthead. Then, dropping down to the deck, I set the shrouds taut with the turn-buckles just above the rail. The mast was now as safe as I could make it.

But there was still the broken bowsprit to repair, and I found it was a job for the carpenter's saw and axe. With these tools I cut a slot in the broken end of the stick, slid it into position, and fastened it there with the iron pin that originally held it in place. This gave me a jury bowsprit[1] eight feet shorter than the original one.

As it proved, however, the hardest part of the job had still to be done, for I had to make a bobstay[2] to hold down the end of the bowsprit. This I did by cutting a piece from the anchor-chain and shackling it into a ringbolt fixed into the cutter's stem just below the water-line. To do this I had to hang head downward from the bowsprit, near the stem, to reach that ringbolt under water: the consequence being that as her bow rose and fell she alternately dipped me two or three feet under water and brought me out dripping and sputtering, to repeat the dose again and again.

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[1] Temporary bowsprit.

[2] Rope leading from the bowsprit to the ship's stem, to keep the former steady.

I don't quite know how I managed to complete the job, but it certainly had to be done, and, at the expense of many unwilling drinks of sea-water, the shackle was got into place and bolted there.

As though in sullen irony, no sooner was this work finished than the gale suddenly moderated. It was just as though the elements were acknowledging that they were defeated, and were surrendering to the gallant little craft.

Taking advantage of this milder weather I made two observations, and located myself in latitude 36.10 North and longitude 62.06 West. My position was thus about 800 miles from New York as the crow flies, but about 1000 to 1200 miles of actual sailing distance.

Although utterly exhausted I was sustained by a keen sense of satisfaction. So much so that I went to work repairing the pump, and soon found the cause of the trouble. A bit of match had stuck in the valve, and this out, I got it working again. After two hours of pumping the boat became clear of water, for I could hear the pump sucking dry—always a joy to a seaman's heart.

Going aloft to make sure the standing rigging was secure, I found the stays had chafed against the mast. It would therefore require careful handling to bring the mast into New York whole. Under the shortened bowsprit and reduced headsails the *Firecrest* was badly balanced, so that when I set the mainsail again I had to reef it by four turns of the boom in order to be able to steer at all, the consequence being that when sailing close-hauled she made much leeway.

I had, however, finished the repair work, so, lashing the tiller, I set my course for New York, and then fell exhausted on my bunk.

ALAIN GERBAULT, *The Fight of the "Firecrest"*

THE RED CROSS OF THE SEA

In the whole field of human activity there is nothing nobler to be found than the work of the life-boat service. "I can bear witness," wrote the great novelist Joseph Conrad, himself a seaman, "to our unshakable belief in the life-boat organization, and to our pride in the achievements of our fellow-seamen, who, husbands and fathers, would go out on a black night without hesitation to dispute our homeless fate with the angry seas."

The following pages trace the work of the pioneers of life-boat rescue work: Wouldhave and Greathead, who respectively designed and constructed the earliest life-boats, and Sir William Hillary, founder of the Royal National Life-boat Institution.

Another pioneer of life-boat construction was Lionel Lukin, who, indeed, designed the earliest British safety-ship, though his purpose was to produce an 'unimmergible' boat rather than a life-boat to be used for the specific purpose of rescuing the shipwrecked crews of other ships.

At about the same time that Lukin was at work upon the development of his 'unimmergible' boat on the Thames, a comparatively poor man of notable character and marked inventive genius was designing in South Shields a boat that should be unsinkable and that would right herself when capsized. This was William Wouldhave, a house-painter and teacher of singing, who eventually became parish clerk of St Hilda in South Shields. . . .

Unlike Lukin, Wouldhave appears to have concentrated his thoughts and endeavours specifically upon the invention of a life-boat, to be set apart solely for the work of saving life from shipwreck. It was the self-righting capacity that he specially sought in the designing of his models, and it was a happy accident that gave him his final inspiration. Early in the year 1789 he happened to take notice of a woman who had been drawing water from a well. The skeel in which she meant to carry away her water was quite full and on the surface there floated the half of a round wooden dish. While Wouldhave sat chatting with the woman, he was abstractedly turning over and over in the water this piece of wood, and presently he began to notice that it would not remain turned upside down but promptly righted itself in the water no matter how carefully or how often he reversed it. In fact, owing to its shape, the fragment possessed the property he desired in a life-boat: it was self-righting.

Possessed by the significance of this accidental discovery, Wouldhave hurried off to the brewery at which his experiments were conducted (a firm of brewers in the town allowed him the use of their tanks for the testing of his models), and before long he was able to announce that his problems were solved and that he had discovered the secret of self-righting. A little later, the *Newcastle Courant* published an advertisement offering a reward of two guineas for the plan or model of a boat that would keep afloat in stormy weather in the heavily broken water at the mouth of the Tyne. Wouldhave had a self-righting model ready, and submitted it on June 10 of that year. It may be seen to this day in the Public Museum at South Shields.

Examination of this model makes it clear that the essence of Wouldhave's invention lay in the shape of his boat, which was to have a straight keel and high-peaked ends fitted with watertight cases containing cork. There was to be cork within-board along her sides and amidships, and her gunwale was to have a pronounced sheer. Above all else she was designed to be a self-righting boat; and the general opinion is that, judged on this model, Wouldhave might fairly claim to be the inventor of the self-righting boat, just as Lukin could claim to have invented the extra-buoyant and safe type of boat from which was evolved the staunch but non-self-righting sailing life-boat.

The publication of the advertisement in the *Newcastle Courant*, offering the modest premium of two guineas for the best model of a boat that would live in heavily broken water, was in truth a momentous event, since, in addition to revealing the valuable invention of William Wouldhave, it brought about the first settlement upon our coast of a life-boat station and started upon his career as a builder of life-boats the third of the pioneers whose names will always be honourably associated with the beginnings of their construction—Henry Greathead of South Shields, a boat-builder by trade and one who, as a ship's carpenter, had had practical experience of ships and seafaring.

The advertisement emanated from "The Gentlemen of the Lawe House," an association of South Shields worthies who were in the habit of meeting in a house which had originally been erected as a barracks upon an out-jutting eminence called the Lawe. From this point of vantage these gentlemen must have witnessed many wrecks at the mouth of the Tyne, including that of the *Adventure*, on March 15, 1789, when the whole ship's company perished one by one within full view of thousands of people who were powerless to give them assistance, because no boat then available could live in the violent sea running at the time. A week later the advertisement appeared, and the "Gentlemen of the Lawe House" proceeded to obtain the approval of the Brethren of the Newcastle Trinity House for their plans for the establishment of a life-boat at the mouth of the river.

In response to the advertisement various models and plans were submitted to the committee formed by the "Gentlemen of the Law House," including those of William Wouldhave and Henry Greathead. It was recorded by the chairman of the committee, Mr Fairles, that they did not approve of the model submitted by Greathead, which was shaped like a raft. Neither did they unreservedly accept Wouldhave's model, though of this they must have thought highly, since they decided to award its inventor one-half the premium. The story goes that, after telling the committee what he thought of their conclusions, Wouldhave rejected their proffered guinea and strode out from their meeting-place, leaving his model at their disposal. Remonstrated with by his friends on the point of policy involved in leaving his model behind him, Wouldhave is reported to have said: "Never mind, never mind; I know they have sense enough to adopt the good points of my model, and, though I am poor, if they refuse to give me the reward, I shall still have the satisfaction of being instrumental in saving the lives of some of my fellow-creatures."

At this stage the chairman of the committee, Mr Fairles, and another member, Mr Rockwood, who had himself suffered shipwreck and been rescued from it in a Norway yawl, took matters into their own hands and proceeded to model a boat in clay. . . . Henry Greathead, who was invited to build a boat on this model, suggested giving it a curved or 'rockered' keel. That suggestion was adopted, and, according to Mr Fairles, was Greathead's sole contribution to the design.

The boat was completed before the end of the year (1789). She was named the *Original*, and was launched in January 1790—the first of the regular life-boats to be established upon our coasts. She cost £76.8.9 to build, the total cost, including equipment and cork jackets, being £149.13.9, which figure is said to have included some "margin" as a mark of appreciation for the builder. It is recorded of this first life-boat that she was the means of saving hundreds of lives; that, owing to the skill with which she was handled, no lives were lost from her, and that she did regular service for forty years, until, in 1830, she was dashed to pieces on the rocks. This fine record, even when considered apart from the notably historic fact that it formed the beginning of the first regular life-boat service (which has been continued without a break down to the present day), represents a splendid tribute to the memory of Mr Fairles and Mr Rockwood and the other "Gentlemen of the Lawe House," to William Wouldhave and Henry Greathead, and to the people of Tyneside.

Just as it has truly been said that the story of the evolution of life-boat construction is "as English as the cliffs of Dover," so might it be said that the story of the Royal National Life-boat Institution, and of the great man who first appealed to our race to bring it into being, is British through and through, and something of which every subject of the King may well be as proud as we are of the Royal Navy, of "the old Red Ensign," and of the men who have sailed under it to every navigable quarter of the globe. . . .

Enthusiasm and virility were characteristic of the generation that produced the Englishmen who fought at Trafalgar and Waterloo; but in that or any other age William Hillary would have been remarkable for his endowment of energy, personal bravery, and passionate and devoted love for his fellow-men. These attributes would seem to have dominated his life from beginning to end. A man of ancient and aristocratic French lineage, his ancestors were settled for more than three centuries in Yorkshire, and it may safely be said of him that the most ardent democrat never spent himself more lavishly in the service of his fellows, and of the humblest of those about him, than did Hillary. Service—the service of his country and of his fellow-men—was the ruling passion of his life; and there is thus a satisfying fitness in the fact that his initiative should have brought into being the organization which, for a century now, has controlled and directed the most selfless and humane of all great services.

To the fact that Hillary made his home in Fort Anne (now the Fort Anne Hotel) in the Isle of Man we owe the stimulation in him of that determined practical interest in the whole question of the perils and hardships of shipwreck which eventually led to the publication of his famous *Appeal to the British Nation.*

The loss of lives (and valuable vessels with their cargoes) which each season's storms were causing on our coasts at that period was very dreadful, and no systematized effort of any kind was being made to mitigate it, despite the splendid bravery of individual acts. Nowhere was the toll of brave lives sacrificed heavier than upon the coast of the Isle of Man.

It is not difficult to understand that a temperament like that of Sir William Hillary, compact of generous courage and magnanimity, must have been stirred to its depths by the contemplation of such a series of wrecks as was witnessed on the Isle of Man coast in the year 1822. Again and again the residents of Douglas, for example, saw the tragic spectacle of seamen clinging for hours to the rigging of vessels swept into Douglas Bay, only to perish by drowning as one by one they fell exhausted into the trough of the sea, or were battered to pieces, with their ships, upon the rocks of that perilous shore.

Such sights must have been very harrowing, even to the minds of the least imaginative residents upon the coast, who accepted as if it were an unalterable dispensation the fact that no means existed for coping in any way with these disastrous conditions. For such as Sir William Hillary the thing went far beyond mere distress of mind and the expression of sympathy. Life-boats or no life-boats, this indomitable man had to be up and doing, making heroic efforts, with all and any means that might come to hand and with never a thought for his personal safety, to carry succour to the victims of those disasters from which no traveller or mariner, then or now, could consider himself immune. Time and time again he exposed himself to instant peril by putting off from the shore, in boats that were in no sense fitted for such work, in the effort to save lives that must otherwise be sacrificed within full view of the townsfolk of Douglas. In the one season just mentioned, to go no farther, H.M. cutter *Vigilant* and H.M. brig *Racehorse* were both wrecked there—54 lives being saved from the former, and 100 from the latter—in addition to no fewer than ten other vessels. In these wrecks Sir William Hillary played a leading part in rescuing 84 lives which must otherwise have been lost.

There is no doubt that it was his experience of rescue work during this calamitous season—all seasons were then calamitous in the number of lives lost in every shipwreck—which inspired him in his *Appeal to the British Nation*, published in 1823 by Geo. B. Whittaker, of Ave Maria Lane, London, and dedicated to the King.

The writer's practical good sense no less than his humanity shines forth in such passages as this:

> Though many individuals have employed their time, their attention, and often exposed their personal safety for this object, yet nearly the whole of the most extensive and dangerous parts of our coast are left without any means having been adopted, any precautions taken, for rendering assistance to vessels in distress; and winter after winter we have the most afflicting details of the consequences attendant upon this lamentable apathy to human misery—an awful destruction of life, on almost every shore which surrounds the British dominions. These are not arguments founded on the visionary contemplation of remote or improbable dangers. Their urgent necessity must be obvious to every mind. So long as man shall continue to navigate the ocean, and the tempests shall hold their course over its surface, in every age and on every coast,

> disasters by sea, shipwrecks and peril to human life must inevitably take place; and, with this terrible certainty before our eyes, the duty becomes imperative that we should use every means to obviate and to mitigate the deplorable consequences. Individual efforts, however meritorious in themselves, are unequal to produce all the benefits contemplated, or to remedy all the evils resulting from one of the most tremendous of perils to which human nature is exposed, and which is most likely to fall upon those who are in the very prime of manhood, and in the discharge of the most active and important duties of life. From the calamity of shipwreck no one can say that he may at all times remain free; and whilst he is now providing only for the safety of others, a day may come which will render the cause his own.
>
> Local associations cannot call forth the energy which such a cause demands at our hands; they are only partial benefits, whilst the great evil remains unredressed. . . . This subject in a peculiar manner appeals to the British people collectively and individually. For ages, our seamen have been the acknowledged support of our splendour and our power; and until everything which the ingenuity of man can suggest, and every inducement and regulation which social institutions can offer and arrange, have been combined into one great plan for their safety, we shall be wanting in our best duties to them, to our country, and to ourselves.

The necessity for national and co-ordinated organization was from the first very present in Hillary's mind. And, in the same way, the breadth of his humane vision was from the outset of his *Appeal* illustrated by its insistence upon the comprehensive nature of the National Service he advocated:

> The people and vessels of every nation, whether in peace or in war, to be equally objects of this Institution; and the efforts to be made, and the recompenses to be given for

their rescue, to be in all cases the same as for British subjects and British vessels.

In detail, as in their fine spirit, the principles laid down by Sir William Hillary have been, and are to this day, scrupulously carried out in our Life-boat Service; as is illustrated, for example, by the fact that, of the total of lives saved on our coast during recent years, nearly one-fifth have been rescued from foreign vessels. The *Appeal* itself has been described as a monument to a great man's memory; but it follows, as a matter of course, that the noblest and greatest memorial we have of Sir William Hillary is the Royal National Life-boat Institution itself, with its splendid fleet of life-boats, its thousands of brave and willing workers, and its wonderful record of lives saved. In face of such a monument as that, the name and fame of Hillary should surely never be forgotten, so long as a ship remains afloat that carries the British flag!

A. J. DAWSON, *Britain's Life-boats*

15/67

LIFE-BOATS IN WAR-TIME

In the previous extract tribute is paid to those whose efforts helped to launch Britain's first life-boats. From those days to our own the life-boat service has continued without a break its heroic task of saving those in distress on the sea.

Even in peace-time those who man the life-boats that battle with the elements for human lives have their courage and endurance tested to the full. In war-time the dangers which they have to face are necessarily multiplied. In the following extract, taken from an official report of the Royal National Life-boat Institution, some idea is given of how these dangers are met, and of how, in modern times, the spirit of old Sir William Hillary still lives.

In peace-time wrecks come singly. In war it is different. Vessels move together in big convoys. When they are in danger, they are in danger together. When they are wrecked, two or four or six may be wrecked on the same spot and at the same time. Life-boats have toiled for many hours going to ship after ship helpless in the same gale, or ashore on the same sandbank. . . .

Of such rescues the finest was in the summer of 1941. It was in that stretch of sea on the East Coast between Great Yarmouth and Sheringham, which has come to be known as "E-boat Alley," for it is there that the German E-boats from Holland come to attack the convoys in the channels, kept swept of mines, which are now the high roads of the North Sea.

A north-westerly gale was blowing, and in the early hours of the morning six steamers struck on the Haisborough Sands. It is a name as ominous to seamen as the more famous Goodwins. Five life-boats were summoned to their help and the first on the scene was the Cromer No. 1 life-boat.

She arrived to find the six steamers so battered by the heavy seas that already they were going to pieces.

She went first to a steamer of which only the masts, funnel, and upper works amidships were above water. Sixteen of the crew, roped together, were on the top of the engine-room behind the funnel. There was nowhere on the steamer where a rope could be made fast, but the coxswain could see in her upper works a wedge-shaped opening, which the seas had made. He took the life-boat right over the submerged deck and drove her bows into that opening.

The seas kept washing her away; but again and again he forced her bows back, and held her there. She was bumping heavily on the submerged deck; the seas were breaking over her; but he held her there until the sixteen men had been hauled aboard.

Then he took her to another steamer. This was a simpler business, for the steamer was above water. He went alongside her and the crew jumped aboard the life-boat or slid down ropes—thirty-one of them. He transferred the forty-seven rescued men to a destroyer—there were naval ships standing by and aeroplanes patrolling overhead—and while he was doing it he saw the Cromer No. 2 life-boat (a smaller and lighter boat) arrive. He at once put aboard her his second coxswain to take command, and then went to the help of a third steamer.

This steamer also was under water. Only her bridge could be seen. There nineteen men were gathered. Again the coxswain took the life-boat right over the submerged bulwarks and decks, and laid her alongside the bridge. He kept her engines working all the time—now ahead, now astern—and so held her against the bridge, in spite of the fierce wash of the seas, until the nineteen men had jumped into her.

The Cromer No. 2 life-boat was alongside a fourth steamer, and the Great Yarmouth and Gorleston life-boat had now arrived and had gone to the rescue of a fifth. There was still one steamer left, and to her the Cromer No. 1 life-boat went. She was lying on the sands with her back broken. The surf seething round her was so shallow that twice the life-boat herself bumped heavily on the bottom and once she ran right aground. At that moment she was helpless, out of command. The next sea might have rolled her over and over and washed every one out of her. But it lifted her off the sands; she was under her coxswain's control again, and he brought her safely away. It was now about one in the afternoon, three hours since the Cromer No. 1 life-boat had reached the sands. The work was finished.

Between them the three life-boats had brought off 119 men. Others had been brought off by a whaler from one of the destroyers. Those lives had been rescued, as the admiral in command at the Nore said in a message to the life-boat crews, "by superb seamanship and courage."

When the Cromer No. 1 life-boat reached Yarmouth she was found to be badly damaged. She had twice been driven over sunken wrecks. She had bumped on the sands. She had run aground. The result of it all was that she had three holes in her port bow; that her bow-pudding, twenty feet of her port fender, and the greater part of her stem had been torn off; that the brass bolts of the stem had been driven right through six inches of solid oak and had pierced air-cases inside the hull. That was the damage which she had done to herself; but she had rescued eighty-eight lives.

Two months later the Cromer No. 1 life-boat went out to a steamer stranded on the Hammond Knoll, and found what her coxswain described as "the most appalling problem" that he had ever seen.

A gale was blowing, with fierce squalls. The seas were running in opposite directions along the weather side of the steamer, and when they met were going up nearly mast high and crashing on her deck. On the lee side they were running in all directions and were strewn with the steamer's cargo.

The life-boat approached the steamer, on the lee side, at half speed. She had to come in broadside to the sea, and, in the coxswain's own words, "a huge wall of water suddenly rose up on the port side, a shout of 'look-out,' and before I could give even a half-turn to the wheel, I was lifted out of the boat just as though I had been a bit of cork." The second coxswain and three other men, out of that whole crew of eleven men, were washed overboard with him.

How the life-boat righted herself after that awful blow, the coxswain could not understand. She went so far over that the captain of the steamer, a hundred yards away, could see her keel; but right herself she did, and the second coxswain's son seized the wheel. He rescued his father; he rescued the coxswain, who at once took command again; and then the other three men were rescued, but they were so water-logged that it took five minutes to drag each of them aboard.

The last man, the signalman, had been in the sea for twenty-five minutes. He was unconscious. The others revived him. He sat up; he spoke a few words; he pulled on some gloves. Then suddenly he collapsed and died.

The life-boat had now been out for seven hours. Her crew were exhausted. Ropes had been washed overboard. They had got round the propeller and made it very difficult to manœuvre her. The coxswain decided to sail for Gorleston, a journey of twenty miles.

On the way he passed, unseen, the Great Yarmouth and Gorleston boat going to the rescue. She made five gallant attempts and got alongside the steamer, but a rope broke at the critical moment and she was swept right away. The seas were increasing. Darkness was setting in. The captain of the steamer himself signalled to the life-boat to give up her attempt.

At six o'clock in the evening the Cromer life-boat reached Great Yarmouth and telephoned at once to Cromer for dry clothes, fresh oilskins, and another man. They came at once by car, and at 4.40 next morning the Cromer life-boat set out again on her twenty miles' journey against the gale back to the wreck. It took her over three hours, but when she reached the sands, just after daybreak, wind and sea had both gone down. She was able to get alongside the steamer and make fast. In half an hour she had rescued the forty-four men on board. . . .

Again and again during the war life-boats have gone out taking doctors and ambulance men to the wounded; and again and again their own work has been made more difficult and more painful because so many of the men rescued have been injured—men dazed, broken, helpless, clinging to rafts or pieces of wreckage on the waters where, only a few minutes earlier, their ship had been.

Of twenty men whom the Southend-on-Sea life-boat rescued from a steamer which had been bombed and sunk, every one was injured, and the life-boat men dressed their wounds as they brought them ashore. The Clacton-on-Sea life-boat went to the help of a small vessel which had struck a mine and had sunk in half a minute. She found the crew of seven men. Three were in a waterlogged boat; three on a small raft; one lying across the remains of two hatches. All were injured or suffering from shock, and the skipper had both legs broken.

The St David's[1] life-boat went out in a rough sea to a steamer which had been attacked by three German bombers. After they had wrecked her with bombs they had circled round for nearly an hour machine-gunning the crew. The life-boat found the master first. He was floating in the sea, holding to a plank. One leg was fractured. He had wounds in the head. From loss of blood he was scarcely alive, and two of the life-boatmen had to go into the sea to loosen his grip on the plank and help him aboard. Then the life-boat found the second engineer, clinging to a piece of wreckage. Then, guided in that rough sea by a pole with a jacket on it, they found a raft with thirteen men—all that remained of the crew of twenty-four. Several were injured, one seriously. As the life-boat made for home she sent a wireless message asking for doctors, nurses, and an ambulance to be waiting for her, and her crew did what they could for the skipper and the other badly wounded man; but before she arrived both were dead.

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[1] Pembrokeshire.

All sorts of jobs have come upon the life-boatmen in these thirty months of war, from towing in a ship loaded with ammunition, which had been badly damaged by a mine, to feeding with their iron rations of biscuits and chocolate a tug full of women and children who had escaped from France.

Life-boats have put out with coastguards and guns to sink mines and with fire-pumps and firemen to a steamer which had been set ablaze by bombs. They have brought in barrage balloons which had broken loose and fallen into the sea, and pursued a landing-stage which had gone adrift with soldiers and a searchlight on it. . . .

Amid all the variety of service, the unexpected duties, the sudden emergencies, and the strange contrasts of war, one thing remains the same—the life-boatmen themselves. Nearly ninety years ago Charles Dickens wrote of those whom he knew on the coast of Kent:

> Let a gale arise and swell into a storm . . . let them hear through the angry roar the signal gun of a ship in distress, and these men spring up into activity so dauntless, so valiant, and heroic, that the world cannot surpass it.

Love K.M.: Loog 1st Jeon Sec. B 1946

Dickens wrote that at a time when Great Britain was at war—but the war was far away. Now that it is in our own seas, on our own shores, in our own air—and the life-boatmen of Kent have been across the seas to help in rescuing a British Army—he would say the same, but say it, if it were possible, in a greater heat of admiration.

From *The Life-boat Service and the War*

3/70
M. Khan
T-D-C
Roll no— 430
11.P.M.

TWO MEN IN AFRICA

The death, in 1941, of Henry W. Nevinson at the age of eighty-five deprived English journalism of one of its grandest figures—a fearless war correspondent, a tireless champion of liberty, and a brilliant writer.

In 1904 he travelled to Portuguese East Africa to expose the slave trade that was still being carried on there. In the course of his journeys he endured the discomforts of over a thousand miles of travel by ox-wagon and on foot in the interior of Africa—and at Benguela, the chief slave-trading town, the even greater discomfort of being poisoned.

On his way home after these adventures he put in at the port of Loanda; and here he suddenly imagined himself standing side by side with the ghost of another famous visitor to Loanda—David Livingstone. In the following extract the great journalist pays tribute to the great explorer.

For nearly three weeks I stayed in Benguela, being offered lodgings with one of the Dutch traders. Bunyan's precept "To live each day as 'twere your last" may be good in theology, but it brings no comfort in daily life, and warnings of my danger at the hands of the Portuguese slave-traders came to me from café gossip, the British engineers working upon the beginnings of the first railway, the officials of the telegraph office, and the Dutch traders. Two or three of the British, including a man named Rawstorne, who had known me in Ladysmith, made themselves into a kind of bodyguard, accompanying me everywhere I went at night, without telling me of their purpose. But nothing unusual happened till the night before the Portuguese ship was starting. Then I was seized with the common symptoms of violent poisoning, and in the morning Rawstorne carried me down to the pier bluish, cold, and repeatedly fainting. Doctors have told me that the poison was probably aconite, but its nature was unimportant. No one was surprised at my condition, for all the Portuguese and the British were quite aware that the object of my journey was to expose the suspected abomination of the slave-trade in the Portuguese provinces. Large wealth for the [Portuguese] Government and the traders was involved, and what was the life of one unknown traveller in comparison? Skin for skin, yea, all that a man hath will be given for a comfortable income. There were recent instances of honourable Portuguese who had set out for Portugal to expose the infamy but had never arrived.

When we came to anchor in Loanda on the 10th of June, 1905, I knew that I must still spend about three weeks in visiting the cocoa plantations on the islands of San Thomé and Principe. Then only sixteen days to Lisbon. Then a British ship, and only four or five days to Liverpool and home! From Loanda I could fairly expect to be home by July the 20th. Home, friends, decent meals, a real bed, and security! It was one of the radiant moments of life.

I looked down upon the fo'c'sle of the steamer and saw the two hundred and seventy slaves now collected to their full number. They were lying about the deck in stupefied indifference or despair. No going home for them; no security, no decent meals or beds, no expectant friends, nothing but ceaseless toil in a steamy atmosphere like a hot-house—ceaseless toil day after day till death ended it and their bodies were flung away into the forest. It was a different fate from mine, and as I turned I found standing close beside me the shrivelled and worn figure of a man with something striking about his face and bearing, though he was obviously in the extreme stage of fever and tropical disease.

There was no mistaking that famous and noble ghost. I knew that fifty-one years before, he himself had emerged at

Loanda from the interior. And after what a journey! I suppose the greatest journey of exploration ever accomplished in the history of man, unless Marco Polo's journey equalled it. He had left Capetown in June 1852, and he reached Loanda in May 1854, having in two years traversed about three thousand miles of almost unknown country in the south and centre of Africa. Upon that uncharted course he had been confronted by all the perils of savages, wild beasts, and disease. He had passed among tribes whose method with enemies was to hew them in pieces and fling the limbs to the crocodiles in the rivers. He had travelled by ox-wagon, by riding-ox, and on foot, and those who have known what long marching is in Central Africa know the anguish of feet festering with jiggers or inflamed by the bites of other poisonous insects. He had made his way among drenching rains and had waded through flooded swamps, soaked to the skin by day and night, with never a chance to dry. Various fevers had held him torpid for many days together, and dysentery had drained the blood of his body till he could hardly stand upright or sit the riding-ox. Most of his outfit was stolen early on the journey, and before he reached Loanda he had little but rags remaining. Yet he had mapped his route by the stars as he went along, and had traced the course of many unnamed rivers. His observations of wild beasts, birds, insects, and plants were so accurate that they hold to this day; and his knowledge of the native customs and laws laid the foundation of a modern science.

Travelling northwards from the Cape, as he had travelled two or three years earlier, he had passed through Griqualand, Bechuanaland, and, skirting the Kalahari Desert, had entered the wide district then called by the general name of Barotseland. It was partly inhabited by the tribe of Makolo, whose young chief, Sekelétu, became very friendly and accompanied Livingstone on a long journey about the unknown land, proceeding with him even as far as Naliele, which was nominally the chief village or town. But the main centre of Livingstone's life among the Makololo was again Linyanti, a largish place on the River Chobe, a tributary of the Zambesi. . . . He reached Linyanti in May 1853, and he returned there in November in order to make it the starting-place for the final stage of his great journey. . .

In November 1853 the small party (Livingstone and twenty-seven natives) started in canoes down the winding and branching River Chobe, and Livingstone gives a full list of his stores. For defence and shooting for food he took three muskets, a rifle and a double-barrelled smooth-bore, besides ammunition distributed for safety among the baggage. For food, to avoid heavy loads, he took only a few biscuits, a few pounds of tea and sugar, and twenty pounds of coffee, which, without milk or sugar, he found the most refreshing drink after fatigue and exposure to the sun. For clothing he took one small tin canister filled with shirting, trousers, and shoes for civilized life if he should ever reach it, a bag for spare change, a box for medicines, another for books (a nautical almanack, Thomson's Logarithms, and a Bible). Another box contained a magic lantern, which he found of great service in impressing the natives. The sextant, artificial horizon, thermometer, and compasses were carried apart. He had also twenty pounds of beads for bargaining, a small gypsy tent to sleep in, a sheepskin mantle as a blanket, and a horse-rug as a bed. As he remarks himself, the outfit might seem spare, but he always found the art of travel consisted in taking as little baggage as possible; for failure chiefly lay in want of pluck or in carrying such a lot of things as to excite the cupidity of the tribes.

At the junction of the Chobe with the Zambesi (here called the Leeambye) he turned north up the main river till he passed Libonta, and reached the territory of the Chief Shinte. Here he left the canoes and set out upon a march inclining westward in the direction of Loanda. This was the most difficult part of all his journey. He entered the tropical forest where there was no track except the narrow paths leading from kraal to kraal blocked by dense growth on either side. Rain fell incessantly. His clothes went mouldy and his tiny tent rotted. The wet was his chief enemy. As he wrote at the time, he did not care much for fatigue. Marching did not hurt him, but when stopped dead by pouring rain, fever laid hold on him and he had to lie dormant, soaked through in his worn-out tent.

Every other disaster that can befall the traveller in tropical Africa followed. At one place the appointed guides refused to show the way unless paid extra in cloth on the spot. On reaching the wide territory of the Chibokwe, he had serious trouble with some of the tribes, and saved his little party from destruction only by arranging his Makololo so as to surround the excited and violent enemy, and showing himself in a stronger position even with only five guns. Then he told them he was quite ready to fight, but they must strike the first blow. Once when the fever was at its height and his men thought him dying, they broke into open mutiny, jeering at him and refusing to obey his orders. Whereupon he rushed out at them with his double-barrelled pistol, and proved to them that their lives as much as his own depended upon discipline in the camp. Mutiny never recurred.

But the most critical moment for any African traveller is when his men fling down their loads and refuse to go any farther. Livingstone's men were indeed worn out. Continually harassed and dogged by hostile, thieving, and murderous tribes, they despaired of their leader's power to bring them to the sea. They urged him to turn back and seek the safety of Linyanti again. He replied that he would go on alone, and when he withdrew to his tent, they presently came to him saying they would die for him and never leave him. He was at that time so reduced by fever that he could neither ride the ox nor march, and his men had to lead him along, one on each side, to prevent him from falling. Happily they had now almost reached the border of Portuguese territory, and after crossing the Quango, Livingstone was hospitably received by the commandant of the fort, and given a negro guide down to the coast. This kindliness to a man who had appeared like a shrunken and powerless corpse among them without warning or credentials lasted all down the forest paths till the sea was visible and the descent of the hill into Loanda began. In his Journal he naturally speaks with gratitude of the Portuguese traders, many of whom, as he then believed, disapproved of the slave-trade. But we read that to several of these passages he afterwards added "an expressive series of marks of interrogation."

His Zambesian men, having more knowledge of Portuguese slave-trading than in those days he had himself, were terrified lest when they came to the sea they would be kidnapped and sold into slavery. Understanding their fears he made them his final pledge: "I am as ignorant of Loanda as you are," he said, "but nothing will happen to you but what happens to myself. We have stood by each other hitherto, and will do so to the end." None the less, at the end of Chapter XIX in his great book, he adds the paragraph:

> They were now somewhat apprehensive of suffering want, and I was unable to allay their fears with any promise of supply, for my own mind was depressed by disease and care. The fever had induced a state of chronic dysentery, so troublesome that I could not remain on the ox more than ten minutes at a time; and as we came down the declivity above the city of Loanda on the 31st of May (1854), I was labouring under great depression of spirits, as I understood that, in a population of twelve thousand

> souls, there was but one genuine English gentleman. I naturally felt anxious to know whether he was possessed of good nature, or was one of those crusty mortals one would rather not meet at all.

He need not have feared. In Mr Gabriel, the British Commissioner for the suppression of the slave-trade, he discovered, as he says, "a real wholehearted Englishman." He adds a sentence which all travellers emerging from uncivilized countries will appreciate:

> Seeing me ill, he benevolently offered me his bed. Never shall I forget the luxuriant pleasure I enjoyed in feeling myself again on a good English couch, after six months' sleeping on the ground.

But, in spite of all this luxuriant comfort, the malarial poison still prevailed. He had arrived at the end of May, but in August he suffered a serious relapse which, as he writes, reduced him to a mere skeleton. While he lay prostrate, his Zambesian men kept themselves well supplied by gathering firewood from the forests and helping to unload a ship which came bringing coal for the British cruisers lying in the harbour to control the export of slaves. . . .

Almost prostrate with malaria and rheumatism, Livingstone remained for several weeks in the comfort of Mr Gabriel's home. Meantime a small squadron of three British cruisers or gunboats had arrived, and the officers showed him and his Zambesians every possible kindness. They offered him a passage home in one of the ships. The fame of his arrival on the coast had reached London. What the enthusiasm for the great traveller's exploit rapidly became may be judged by the record of what his reception in Great Britain actually was when at last he reached home two years later—the private interviews with Queen Victoria and the Prince Consort, a specially minted gold medal (the highest honour that could be granted by the Royal Geographical Society), the Freedom of the Cities of London, Edinburgh, Glasgow, and Dublin, receptions of honour at the Universities, vast meetings arranged by the London Missionary Society, banquets, complimentary speeches, and all the public forms that British admiration for a heroic character loves to take. And there were his wife and family too, separated from him since 1852. All were waiting to receive him at home, and here in Loanda lay the British warship offering to take him securely and comfortably to London.

It may be said that honours and receptions would not have appealed to him. In comparison with his passion for exploration, all the gold medals, banquets, freedoms of cities, and interviews with royalties would have appeared trivial as passing shadows. But when I remember what he says he never forgot—the luxuriant pleasure he enjoyed in feeling himself again on a good English couch after six months' sleeping on the ground; when I think of that frail body worn to a skeleton by malaria, dysentery, and rheumatism; and when I read his own record of the perils he had faced in the last eight or nine months—perils of soaking wet, wretched food, and hostile savages—then indeed I am overwhelmed at the heroism of his immediate decision. Upon his heart lay his promise to his Makololo and other Zambesians. He had promised that nothing should happen to them which did not happen to himself. He knew that it was impossible for them to return home without his authority and guidance. They would be killed by the Chibokwe or other savages on the way; or else they would be captured and sold as slaves. He had given his word, and would fulfil the pledge.

He arrived in Loanda, as we have seen, on the 31st of May, 1854, and on the 20th of September he quietly turned back to lead his twenty-seven men to their homes in Linyanti and the Barotse region. In all the great history of our country, I have found no action more ennobling or more enviable.

He has left us an account of the outburst of joy among the natives when he arrived with his men at Libonta on the Zambesi—such demonstrations of joy, he says, as he had never witnessed before. It was July the 27th, 1855:

> The women came forth to meet us, making their curious dancing gestures, and loud lulliloos. Some carried a mat and stick in imitation of a spear and shield. Others rushed forward and kissed the hands and cheeks of the different persons of their acquaintance among us. We were looked upon as men risen from the dead, and the most skilful of their diviners had pronounced us to have perished long ago. The men gave us two fine oxen for slaughter, and the women supplied us abundantly with milk, meal, and butter. Our progress down the Barotse valley was just like this. Every village gave us an ox, and sometimes two. We returned to the Makololo as poor as we set out. Yet no distrust was shown, and my poverty did not lessen my influence.

What city banquets or university honours could equal that? He reached his old quarters at Linyanti on the 11th of September, 1855, having left it on the 11th of November, 1853. Only a few weeks later—on the 3rd of November—he set out upon his next great journey of exploration, moving down the Zambesi, past the Victoria Falls, which he then named, and so out to Quilimane on the Indian Ocean, opposite Madagascar.

Such were the memories that filled my mind as I contemplated the shrivelled and enfeebled ghost of that indomitable spirit almost visible at my side while the Portuguese slave-ship lay completing its human cargo in the port of Loanda. It was comfortable to think that in about six weeks I should probably be at home in London again, but all the time I was remembering that trustworthy British heart who here, at the height of a great achievement, had taken no account of comfort or fame, but to redeem his promise to a handful of unknown and ignorant savages turned back upon the harsh and perilous track he had so lately traversed.

HENRY W. NEVINSON, *In the Dark Backward*

VERY GALLANT GENTLEMEN

For an inspiring story of endurance it would be hard to surpass that of Scott's ill-fated return journey from the South Pole in 1912.

Although the full expedition numbered sixty officers and men, only five of these made the actual journey to the Pole. They were Captain Scott himself, Dr Wilson, Lieut. Bowers of the Royal Indian Marine, Petty Officer Edgar Evans, and Captain L. E. G. Oates, a Dragoon officer. After serious delays caused by howling blizzards this little group reached the Pole. But they suffered a bitter disappointment. A light tent erected near the Pole showed that a party led by the Norwegian explorer, Roald Amundsen, had forestalled them in the discovery of the Pole. Travelling by a different route, they had arrived and left a few weeks earlier than Scott ; and although the primary purpose of the Scott expedition was to make a scientific survey of Antarctica rather than to break records, it was naturally a blow to the tired explorers to realize that after all their killing efforts they had been robbed of the prestige of being the first men ever to reach the southern extremity of the earth.

So, disappointed, weary, and cold, they started on the return journey—800 miles of solid sledge-pulling.

The return was even worse than the outward journey. Sastrugi (frozen snow-waves) made the going terribly hard. There were fearful gales. A misguided change of direction led them into endless difficulties with crevasses and wasted precious time. Food and fuel stores were scanty. Temperatures were desperately low.

Under these terrible conditions the strength of the explorers began to fail. One of them—Petty Officer Evans—collapsed and died. Then Captain Oates began to suffer so badly from frost-bitten feet that he knew he was hindering his companions' chance of pushing on to safety. The story of his heroic struggles and final self-sacrifice is a familiar one, but it can never be too familiar. It has nowhere been more splendidly told than in the simple words of Scott himself, as he jotted down his notes, day by day, in his little tent amid the vast wastes of ice.

SUNDAY, *February* 11. The worst day we have had during the trip and greatly owing to our own fault. We started on a wretched surface with light S.W. wind, sail set, and pulling on ski—horrible light, which made everything look fantastic. As we went on the light got worse, and suddenly we found ourselves in pressure. Then came the fatal decision to steer east. We went on for six hours, hoping to do a good distance, which in fact I suppose we did, but for the last hour or two we pressed on into a regular trap. Getting on to a good surface, we did not reduce our lunch meal, and thought all going well, but half an hour after lunch we got into the worst ice mess I have ever been in. For three hours we plunged on on ski, first thinking we were too much to the right, then too much to the left; meanwhile the disturbance got worse and my spirits received a very rude shock. There were times when it seemed almost impossible to find a way out of the awful turmoil in which we found ourselves. . . We won through at 10 P.M. and I write after twelve hours on the march. I *think* we are on or about the right track now, but we are still a good number of miles from the depot, so we reduced rations to-night. We had three pemmican meals left and decided to make them into four. To-morrow's lunch must serve for two if we do not make big progress. It was a test of our endurance on the march, and our fitness with small supper. We have come through well.

Friday, March 2. Lunch. Misfortunes rarely come singly. We marched to the [Middle Barrier] depot fairly easily yesterday afternoon, and since that have suffered three distinct blows which have placed us in a bad position. First we found a shortage of oil; with most rigid economy it can scarce carry us to the next depot on this surface. Second, Titus Oates disclosed his feet, the toes showing very bad indeed, evidently bitten by the late temperatures. The third blow came in the night, when the wind, which we had hailed with some joy, brought dark overcast weather. It fell below −40° in the night, and this morning it took 1½ hours to get our footgear on, but we got away before eight. We lost cairn and tracks together and made as steady as we could N. by W., but have seen nothing. Worse was to come—the surface is simply awful. In spite of strong wind and full sail we have only done 5½ miles. We are in a *very* queer street, since there is no doubt we cannot do the extra marches, and feel the cold horribly.

Sunday, March 4. Lunch. Things looking *very* black indeed. As usual we forgot our trouble last night, got into our bags, slept splendidly on good hoosh, woke and had another, and started marching. Sun shining brightly, tracks clear, but surface covered with sandy frost-rime. All the morning we had to pull with all our strength, and in 4½ hours we covered 3½ miles. Last night it was overcast and thick, surface bad; this morning sun shining and surface as bad as ever. Under the immediate surface crystals is a hard sastrugi surface, which must have been excellent for pulling a week or two ago. We are about 42 miles from the next depot and have a week's food, but only about 3 to 4 days' fuel—we are as economical of the latter as one can possibly be, and we cannot afford to save food and pull as we are pulling. We are in a very tight place indeed, but none of us despondent *yet*; or at least we preserve every semblance of good cheer, but one's heart sinks as the sledge stops dead at some sastrugi behind which the surface sand lies thickly heaped. For the moment the temperature is in the −20°, an improvement which makes us much more comfortable, but a colder snap is bound to come again soon. I fear that Oates at least will weather such an event very poorly. Providence to our aid! We can expect little from man now except the possibility of extra food at the next depot. It will be real bad if we get there and find the same shortage of oil. Shall we get there? Such a short distance it would have appeared to us on the summit! I don't know what I should do if Wilson and Bowers weren't so determinedly cheerful over things.

Monday, March 5. Lunch. Regret to say going from bad to worse. We got a slant of wind yesterday afternoon, and going on 5 hours we converted our wretched morning run of 3½ miles into something over 9. We went to bed on a cup of cocoa and pemmican solid with the chill off. The result is telling on us all, but mainly on Oates, whose feet are in a wretched condition. One swelled up tremendously last night and he is very lame this morning. We started march on tea and pemmican as last night—we pretend to prefer the pemmican this way. Marched for 5 hours this morning over a slightly better surface covered with high, moundy sastrugi. Sledge capsized twice; we pulled on foot, covering about 5½ miles. We are two pony marches and 4 miles about from our depot. Our fuel dreadfully low and the poor Soldier nearly done. It is pathetic enough because we can do nothing for him; more hot food might do a little, but only a little, I fear. We none of us expected these terribly low temperatures, and of the rest of us Wilson is feeling them most; mainly, I fear, from his devotion in doctoring Oates' feet. We cannot help each other, each has enough to do to take care of himself. We get cold on the march when the trudging is heavy, and the wind pierces our worn garments. The others, all of them, are unendingly cheerful when in the tent. We mean to see the game through with a proper spirit, but it's tough work to be pulling harder than we ever pulled in our lives for long hours, and to feel that the progress is so slow. One can only say "God help us!" and plod on our weary way, cold and very miserable, though outwardly cheerful. We talk of all sorts of subjects in the tent, not much of food now, since we decided to take the risk of running a full ration. We simply couldn't go hungry at this time.

Tuesday, March 6. Lunch. We did a little better with the help of wind yesterday afternoon, finishing 9½ miles for the day, and 27 miles from the depot. But this morning things have been awful. It was warm in the night and for the first time I overslept myself by more than an hour; then we were slow with footgear; then, pulling with all our might (for our lives) we could scarcely advance at the rate of a mile an hour; then it grew thick and three times we had to get out of harness to search for tracks. The result is something less than 3½ miles for the forenoon. The sun is shining now and the wind gone. Poor Oates, unable to pull, sits on the sledge when we are track-searching—he is wonderfully plucky, as his feet must be giving him great pain. He makes no complaint, but his spirits only come up in spurts now, and he grows more silent in the tent. We are making a spirit lamp to try and replace the primus when oil is exhausted. It will be a very poor substitute and we have not got much spirit. If we could have kept up our 9-mile days we might have got within reasonable distance of the depot before running out, but nothing but a strong wind and good surface can help us now, and although we had quite a good breeze this morning, the sledge came heavy as lead. If we were all fit I should have hopes of pulling through, but the poor Soldier has become a terrible hindrance, though he does his utmost and suffers much I fear.

Thursday, March 8. Lunch. Worse and worse in morning; poor Oates' left foot can never last out, and time over foot-gear something awful. Have to wait in night foot-gear for nearly an hour before I started changing, and then am generally first to be ready. Wilson's feet giving trouble now. We did 4½ miles this morning and are now 8½ miles from the depot—a ridiculously small distance to feel in difficulties, yet on this surface we know we cannot equal half our old marches, and that for that effort we expend nearly double the energy. The great question is, What shall we find at the depot? If the dogs have visited it we may get along a good distance, but if there is another short allowance of fuel, God help us indeed. We are in a very bad way, I fear, in any case.

Saturday, March 10. Things steadily down-hill. Oates' foot worse. He has rare pluck and must know that he can never get through. He asked Wilson if he had a chance this morning, and of course Bill had to say he didn't know. In point of fact he has none. Apart from him, if he went under now, I doubt whether we could get through. With great care we might have a dog's chance, but no more. The weather conditions are awful, and our gear gets steadily more icy and difficult to manage. At the same time, of course, poor Titus is the greatest handicap. He keeps us waiting in the morning until we have partly lost the warming effect of our good breakfast, when the only wise policy is to be up and away at once; again at lunch. Poor chap! it is too pathetic to watch him; one cannot but try to cheer him up.

Yesterday we marched up the depot, Mt Hooper. Cold comfort. Shortage on our allowance all round.

This morning it was calm when we breakfasted, but the wind came from the W.N.W. as we broke camp. It rapidly grew in strength. After travelling for half an hour I saw that none of us could go on facing such conditions. We were forced to camp and are spending the rest of the day in a comfortless blizzard camp, wind quite foul.

Wednesday, March 14. No doubt about the going downhill, but everything going wrong for us. Yesterday we woke to a strong northerly wind with temp. −37°. Couldn't face it, so remained in camp till 2, then did 5¼ miles. Wanted to march later, but party feeling the cold badly as the breeze (N.) never took off entirely, and as the sun sank the temperature fell. Long time getting supper in dark.

This morning started with a southerly breeze, set sail and passed another cairn at good speed; half-way, however, the wind shifted to W. by S. or W.S.W., blew through our wind clothes and into our mits. Poor Wilson horribly cold, could [not] get off ski for some time. Bowers and I practically made camp, and when we got into the tent at last we were all deadly cold. Then temp. now midday down −43° and the wind strong. We *must* go on, but now the making of every camp must be more difficult and dangerous. It must be near the end, but a pretty merciful end. Poor Oates got it again in the foot. I shudder to think what it will be like to-morrow. It is only with greatest pains rest of us keep off frostbites. No idea there could be temperatures like this at this time of year with such winds. Truly awful outside the tent. Must fight it out to the last biscuit, but can't reduce rations.

Friday, March 16, *or Saturday* 17. Lost track of dates, but I think the last correct. Tragedy all along the line. At lunch, the day before yesterday, poor Titus Oates said he couldn't go on; he proposed we should leave him in his sleeping-bag. That we could not do, and we induced him to come on, on the afternoon march. In spite of its awful nature for him he struggled on and we made a few miles. At night he was worse and we knew the end had come.

Should this be found I want these facts recorded. Oates' last thoughts were of his Mother, but immediately before he took pride in thinking that his regiment would be pleased with the bold way in which he met his death. We can testify to his bravery. He has borne intense suffering for weeks without complaint, and to the very last was able and willing to discuss outside subjects. He did not—would not—give up hope till the very end. He was a brave soul. This was the end. He slept through the night before last, hoping not to wake; but he woke in the morning yesterday. It was blowing a blizzard. He said, "I am just going outside and may be some time." He went out into the blizzard and we have not seen him since.

I take this opportunity of saying that we have stuck to our sick companions to the last. In [the] case of Edgar Evans, when absolutely out of food and he lay insensible, the safety of the remainder seemed to demand his abandonment, but Providence mercifully removed him at this critical moment. He died a natural death, and we did not leave him till two hours after his death. We knew that poor Oates was walking to his death, but though we tried to dissuade him, we knew it was the act of a brave man and an English gentleman. We all hope to meet the end with a similar spirit, and assuredly the end is not far.

[It was only too true that the end was not far. For another four days the three survivors struggled on. But ill-fortune dogged them to the last. When they were only eleven miles from a depot with plentiful supplies of food and fuel a blizzard sprang up and raged so furiously that they were unable to leave their tent. For eight days they waited, growing weaker and weaker, but the wild and whirling drift continued without ceasing. On March 29 the last entry was made in Scott's diary.

It was not until the following November that a search party from the base was able to reach the tent where the bodies of the explorers lay. Captain Oates's body was never discovered. But a cross was placed in the snow somewhere near where he must have fallen, with the inscription: "Hereabouts Died a Very Gallant Gentleman, Captain L. E. G. Oates of the Inniskilling Dragoons."

In one of Scott's note-books was found a "Message to the Public" containing these fine words: "Had we lived I should have had a tale to tell of the hardihood, endurance, and courage of my companions which would have stirred the heart of every Englishman. These rough notes and our dead bodies must tell the tale."]

CAPTAIN R. F. SCOTT, *Scott's Last Expedition*

WINGS OVER THE SOUTH POLE

SEVENTEEN years after Captain Scott and his companions had lost their lives in the terrible return from the South Pole, a great American explorer made a successful flight to the South Pole and back, from a base some 800 miles distant. This explorer was Rear-Admiral R. E. Byrd, who three years previously had flown over the North Pole with a companion, Floyd Bennett.

In the following extract Byrd tells the story of the later stages of the South Polar flight, as his plane approaches the mountain pass, 10,000 feet high, leading to the immense plateau where the Pole is situated. With him were three companions.

MCKINLEY had his mapping camera ready to go into action either on port or starboard side. It was for him and the camera he so sedulously served that the flight was made. The mapping of the corridor between Little America[1] and the South Pole was one of the major objectives of the expedition.

Balchen was forward, bulking large in the narrow compartment, his massive hands on the wheel, now appraising the engines with a critical eye, now the dozen flickering fingers on the dials on the instrument board. Balchen was in his element. His calm fine face bespoke his confidence and sureness. He was anticipating the struggle at the 'Hump' almost with eagerness. . . .

The altimeters showed a height of 9600 feet, but the figure was not necessarily exact. More likely than not, the barometric principle on which it operated was influenced by local changes in pressure. Nevertheless there were indications we were near the service ceiling of the plane.

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[1] Byrd's base.

The roughness of the air increased and became so violent that we were forced to swing slightly to the left, in search of calmer air. This brought us over a frightfully crevassed slope which ran up and toward Mount Nansen. We thus escaped the turbulent swirl about Fisher, but the down-surging currents here damped our climb. To the left we had the 'blind' mountain glacier of Nansen in full view; and when we looked ahead we saw the plateau—a smooth, level plain of snow between Nansen and Fisher. The pass rose up to meet it.

In the centre of the pass was a massive outcropping of snow-covered rock, resembling an island, which protruded above and separated the descending stream of ice. Perhaps it was a peak or the highest eminence of a ridge connecting Fisher and Nansen which had managed through the ages to hold its head above the glacial torrent pouring down from the plateau. But its particular structure or relationship was of small moment then. I watched it only with reference to the climb of the plane; and realized, with some disgust and more consternation, that the nose of the plane, in spite of the fact that Balchen had steepened the angle of attack, did not rise materially above the outcropping. We were still climbing, but at a remarkably diminishing rate of speed. In the rarefied air the heavy plane responded to the controls with marked sluggishness.

It was an awesome thing, creeping (so it seemed) through the narrow pass, with the black walls of Nansen and Fisher on either side, higher than the level of the wings, watching the nose of the ship bob up and down across the face of that lone chunk of rock. It would move up, then slide down. Then move up, and fall off again. For perhaps a minute or two we deferred the decision; but there was no escaping it. If we were to risk a passage through the pass, we needed greater manœuvrability than we had at that moment. The pass was uncomfortably narrow. Once we entered it there would be no retreat. It offered no room for turn. If power was lost momentarily or if the air became excessively rough, we could only go ahead, or down. We needed power, and there was only one way in which to get it.

June, anticipating the command, left the radio and put his hand on the dump valve of the main tank. A pressure of the fingers—that was all that was necessary—and in two minutes 600 gallons of gasoline would gush out. I signalled to wait.

Balchen held to the climb to the last degree of safety. But it was clear to both of us that he could not hold it long enough. Balchen began to yell and gesticulate, and it was hard to catch the words in the roar of the engines echoing from the cliffs on either side. But the meaning was manifest. "Overboard—overboard—200 pounds!"

Which would it be—gasoline or food?

If gasoline, I thought, we might as well stop there and turn back. We could never get back to the base from the Pole. If food, the lives of us all would be jeopardized in the event of a forced landing. Was that fair to McKinley, Balchen, and June? It really took only a moment to reach the decision. The Pole, after all, was our objective. I knew the character of the three men. They were not so lightly to be turned aside. McKinley, in fact, had already hauled one of the food-bags to the trap-door. It weighed 125 pounds.

"Harold, a bag of food overboard," I said to June. He signalled to McKinley. The brown bag was pushed out and fell, spinning to the glacier. The improvement in the flying qualities of the plane was noticeable. The "Floyd Bennett" took another breath and renewed the climb.

Now the down-currents over Nansen became stronger. The plane trembled and rose and fell, as if struck bodily. We veered a trifle to the right, searching for helpful rising eddies.

The issue was still in doubt, and Balchen's irritation with the inexorable laws which limited our altitude waxed and grew profane. The head of the pass was still on a level with the plane's line of flight. Balchen was flying shrewdly. He maintained flight at a sufficient distance below the absolute ceiling of the plane to retain at all times enough manœuvrability to make him master of the ship. But he was hard pressed by circumstances; and I realized that unless the plane was further lightened, the final thrust might bring us perilously close to the end of our reserve.

"More," Bernt (Balchen) shouted. "Another bag."

McKinley shoved a second bag through the trap-door, and this time we saw it hit the glacier, and scatter in a soundless explosion. Two hundred and fifty pounds of food—enough to feed four men for a month—lay on that lifeless waste.

The sacrifice was the saving factor. The plane literally rose with a jump; the engines dug in, and we soon gained in altitude from 300 to 400 feet. It was what we wanted. We should clear the pass with about 500 feet to spare. Balchen gave a shout of joy. It was just as well. We could dump no more food. There was nothing left to dump except McKinley's camera. I am sure that had he been asked to put it overboard he would have done so instantly; and I am equally sure he would have followed the precious instrument with his own body.

The next few minutes dragged. We moved at a speed of 77 nautical miles per hour through the pass, with the black walls of Nansen on our left. The wing gradually lifted above them. The floor of the plateau stretched in a white immensity to the south. We were over the dreaded 'Hump' at last. The Pole lay dead ahead over the horizon, less than 300 miles away. It was then about 9.45 o'clock (I did not note the exact time. There were other things to think about).

Gaining the plateau, we studied the situation a moment and then shifted course to the southward. Nansen's enormous towering ridge, lipped by the plateau, shoved its heavily broken sides into the sky. To the right of it Ruth Gade's tented arch gradually became, as we watched, a white inverted porcelain bowl. A whole chain of mountains began to parade across the eastern horizon. How high they are I cannot say, but surely many of them must be in excess of 15,000 feet, to stand so boldly above the rim of the 10,000-foot plateau. Peak on peak, ridge on ridge, draped in snow garments which brilliantly reflected the sun, they extended in a solid array to the south-east. . . .

On the right was a range which appeared to trend to the south nearly to 87°, and more or less parallel to and perhaps a little beyond the 180th meridian—a line of low-hung peaks standing above the swelling folds of the plateau. Now, with the full panorama before us, in all its appalling ruggedness and gothic massiveness, we had a conception of the ice age in its flood tide. Here was the core, the centre point of the Antarctic sheet. How deep it lay under us, whether 1000 feet or 8000 feet, we could not tell. But deep it must be, thus to dominate all but the highest peaks which rimmed it like the walls of a dam. . . .

We were 'riding' the engines, conscious of the fact that if one should fail we must come down. Once the starboard engine did sputter a bit, and Balchen nosed down while June rushed to the fuel valves. But it was nothing; to conserve fuel Balchen had 'leaned' the mixture too much. A quick adjustment corrected the fault, and in a moment the engine took up its steady rhythm. Moments like this one make a pioneering flight anything but dull; one moment everything is lovely, and the next is full of forebodings. . . .

[They pass over the spot which they calculate to be the Pole, and, after a few miles, turn back.]

A few minutes after the turn I opened the trap-door and dropped over the calculated position of the Pole the small flag which was weighted with the stone from Bennett's grave. Stone and flag plunged down together. The flag had been advanced 1500 miles farther south than it had ever been before our expedition reached the Antarctic. June radioed the following message to Little America: "My calculations indicate that we have reached the vicinity of the South Pole. Flying high for a survey. Byrd."

The altimeters indicated our altitude as 11,000 feet.

For a few seconds we stood over the spot where Amundsen had stood, December 14, 1911; and where Scott had also stood, thirty-four days later, reading the note which Amundsen had left for him. In their honour, the flags of their countries were again carried over the Pole. There was nothing now to mark that scene; only a white desolation and solitude disturbed by the sound of our engines. The Pole lay in the centre of a limitless plain. No mountains were visible. In the direction of Little America visibility was good, and so it was on the left. But to the right, which is to say to the eastward, the horizon was covered with clouds. If mountains lay there, as some geologists believe, they were concealed, and we had no hint of them.

And that, in brief, is all there is to tell about the South Pole. One gets there, and that is about all there is for the telling. It is the effort to get there that counts.

R. E. BYRD, *Little America*

THE STORY OF GINO WATKINS

UNDOUBTEDLY the most brilliant of the younger generation of Arctic explorers was Henry George (Gino) Watkins. One day, in the spring of 1932, a cable was delivered to a smiling young man in a small room at the Royal Geographical Society. It bore the laconic address, "Watkins, explorer, England." Gino was then only twenty-five years old, but his fame had already reached the ends of the earth. When still an undergraduate at Cambridge he had organized a successful expedition to Edge Island, an uninhabited island, 2500 square miles in extent, which lies to the south-east of Spitsbergen. He had been intrigued by the fact that parts of the coast-line of Edge Island were shown only by dotted lines, and during the course of some important survey-work he made a crossing of the central ice-cap. When he reached the farther side, with his companion, Forbes, he could not find his ship, the *Heimen*, and he was already short of supplies. It was characteristic of his humour that he could write in his diary at this juncture:

> We are feeling very empty and have only got food for two more days. As a matter of fact, I think one could live on some of the moss round here, as it looks quite good; anyhow, Forbes's socks look meaty enough to last us for some time!

Fortunately they were not reduced to this extremity, for later on the same day they were picked up by the *Heimen*.

Gino Watkins had been fond of adventure from his school-days. He had made mountaineering trips up the tower of his school, and on one occasion he persuaded a pilot to take him up in an aeroplane and 'stunt' above the cricket-field, where he was supposed to be playing. On another occasion he tried to climb the spire of Salisbury Cathedral; he was getting on very well until it started to rain, and he had great difficulty in descending the slippery stones. He spent many holidays ski-ing and climbing in the Alps and in the Tyrol. Once he crashed down a 150-foot slope when out hunting chamois. Although he was terribly battered and only semi-conscious, he had a shot at a chamois while he was waiting to be rescued by the guides.

At the age of twenty-one Watkins went with his friend Scott to Labrador to make exploratory surveys on the boundary of Labrador and Canada. They planned a tributary of the Hamilton river, and then went off to explore the mysterious Lake Snegamook, about which some Indians had talked to them. Their map consisted of a few pencil-lines drawn by an Indian, but they pushed on across lakes and through forests and marshy valleys until they came across a tribe of Indians who were almost starving. Watkins was always optimistic about his food supplies, and he gave a good deal of his remaining stores to the Indians. Eventually he found Lake Snegamook, which proved to be about twenty-five miles long; then he set off for a settlement called Hopedale, on the coast some seventy miles away. The country became more difficult, and the explorers began to run out of supplies, until they had only half a candle left. When things were getting really serious they found a snowshoe trail which led them on to Hopedale and safety. After Christmas Watkins explored the "Unknown River," and he found four large waterfalls, potentially of great industrial value.

From his early years he had been interested in flying, and he now began to advocate an Arctic air-route between Europe and America. The route proposed would cross the Faroes, Iceland, Greenland, Baffin Island, and Hudson Bay. The advantages were that this was the shortest way to the centre of America, and the sea-crossings are nowhere very long.

The disadvantages were that the route ran for a long way along the Arctic circle, and for a great distance, especially on the Greenland ice-cap, was unsurveyed and practically unknown.

Watkins proposed to set up a base at the Eskimo village of Angmagssalik, and from there seek out a suitable landing-ground. In order to learn something about the meteorological conditions on the ice-cap, a camp was to be established about 140 miles inland, where observations could be taken for a whole year. Also a number of sledging trips could be made acrosss the ice-cap, and a survey of the mountains along the east coast.

Gino took a great deal of trouble to ascertain what was the best sledging-ration for his expeditions. Having worked out a diet, which included large quantities of fat, he decided to try it out for a week in London, doing his best to create Arctic conditions. He slept by a window with practically nothing on, and skated at the Hammersmith ice-rink before he had his breakfast of porridge, pemmican, and margarine. Even when invited out to dinner he took with him his little paper bag of greasy rations ![1]

One fine day in July the *Quest* nosed her way through the pack-ice to the Eskimo settlement of Angmagssalik. The natives welcomed her with an energetic dance. Two days later a base had been found about thirty miles west of the village, where there was a suitable beach for sea-planes and a good position for the wireless masts. The heavy work of transporting stores completed, the *Quest* went off to survey the coast for 200 miles to the north, in the hope of finding a really good station for flying-boats. Watkins accompanied the ship with an aeroplane, and eventually they found a small fjord with a fresh-water lake at its head. This fateful spot they called Lake Fjord, and it proved to be an excellent flying base.

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[1] It should be added that he disliked having to make himself thus conspicuous.

Meanwhile the central ice-cap station had been established by five men, who had marched 250 miles across the lifeless desert of ice. Watkins had hoped to be able to make a number of sledge trips along the axis of the ice-cap from this weather-station; but he found that the climb up the crevassed slopes to the summit was such a lengthy and exhausting proceeding that it would be possible to arrange only a small southern expedition.

Scott and Watkins, with four others, arrived at the ice-cap station to find the two occupants well and in good spirits. Bingham and D'Aeth now took charge of the station, while Watkins and Scott set off southward down the middle of the ice-cap. They hoped to find a transverse valley, which would be easy for aeroplanes to follow, and then they planned to return to the base via the coastal mountains. During the first three days they travelled at the rate of just over one mile an hour. The men and their fourteen dogs were eating twenty pounds of food a day and they had reasonable hopes that, since the loads would soon become lighter, they would be able to travel three or four hundred miles. On the fourth day they crawled out of the tent into a miniature blizzard. This was followed by a warm, snowy day, and then a sudden drop of 60 degrees in the night. The sudden change made the dogs listless and miserable, and Gino suggested that they should be given extra food. . . .

They travelled on slowly. The dogs seemed to be listless, and after they had journeyed about a hundred miles in a southward direction they turned eastward for the mountains. Then came a blizzard which kept them in the tent for fifty hours. The snow was still drifting when they started again, but they travelled steadily onward over a snow-crust that was not quite firm enough to bear a man without snowshoes.

Towards evening one of Scott's shoe-bindings worked loose, and when he stopped to fix it the dogs suddenly started off at a trot. Gino set off in pursuit with quick, short steps, breaking through the crust every four or five yards; several times he almost reached the handle-bars and then stumbled. It was growing dark, and there was a distinct prospect that the explorers would be left with only one sleeping-bag and half the provisions. Gino made a final effort, dived for the sledge, caught it, and held on; the dogs, having thoroughly enjoyed the game, promptly lay down. Watkins later admitted that this had been one of the most anxious occasions of his life. . . .

To round off the expedition, Watkins now organized a number of journeys for various members. One party went to Mount Forel and climbed to a record height for the Arctic; another party crossed the ice-cap to Ivigtut; and another crossed to Holsteinborg. Watkins himself, accompanied by Lemon and Courtauld, planned to join his comrades by sailing round the south coast of Greenland in an open boat.

This plan at first sounded suicidal, because in the small outboard motor-boat, if they carried enough fuel for the engine to carry them the 600 miles to the nearest West Greenland village, they would have practically no room for food. Watkins, however, had been busy learning how to use a *kayak*, and he was confident that he could provide enough food by hunting as they went along.

Eventually Watkins decided to take two boats instead of one, since this would allow him to carry a certain amount of supplies to eke out the proceeds of the hunting. They also had three *kayaks* and three hand-sledges, a wireless transmitter, and tools for building in case they had to winter. For the first ten days they had good weather, and were able to make their way slowly along the coast, threading their way between the icebergs and rocky islets. At night a tent was pitched on a mossy beach and the boats were tied up in a cranny. Gino was successful with his hunting, and usually he came back with a seal or some gulls or ducks. They made several landings and surveyed a good deal of the coast-line, which had never before been mapped.

Beyond the half-way mark the weather was less favourable, and the sea often had a nasty swell. The engines were soaked with rain, and more than once suddenly cut out, so that the boats began to drift against the icebergs. Once, when the boat was being swamped in the heavy swell, Courtauld jumped up to get a bucket and the outboard motor kicked overboard. Courtauld just caught it as it went under, but the wetting put it completely out of action. The others quickly got the oars, and in the nick of time they were able to get enough way on to pass between two icebergs.

From this point onward they had so much trouble with the engines that they decided to abandon one of the boats with all the wireless gear. Then, having persuaded the other engine to work, they kept it going continually, filling up with petrol from a teapot as they went along. On September 19 they reached the most critical stage of the whole journey. They had gone too far to risk turning back, the coastal mountains were so high that there was no possibility of making a crossing of the ice-cap from this region, and before them stretched the thirty miles of the dreaded Puisortok glacier front. This glacier is a great iceberg manufactory. It frequently 'calves' huge masses of ice, which shoot down under the water like submarines and emerge again offshore to deal destruction to any boat in the vicinity. The first attempt to pass was foiled by bad weather and 'brash' ice. Then the engine refused to work, and the boat, which had been bumped about a great deal by rocks and ice-floes, was leaking like a sieve. For ten days following either the weather was too bad or some accident held up the start; and it really began to look as if they would be compelled to winter in this bleak spot. At last the explorers got the engine to limp along shakily, and so they chugged along at about the rate of one knot past the frowning glacier, every moment fearing that a mighty crash would herald the birth of a devastating ice-torpedo. Slowly they drew in behind some islands and found a place where they could camp.

By this time the engine seemed to be almost hopeless. They took it to pieces as far as they could, but found they had not all the necessary tools. Then some one suggested that they should disconnect the silencer. Immediately the engine went full speed, and that trouble was cured. The next day they travelled fifty miles, but by this time the sea was freezing harder every night, and the boat was leaking so badly that one man had to be constantly bailing. Luckily they encountered a party of Norwegian fox-hunters, who fixed them up with provisions and materials for making the boat almost water-tight again. So they entered the fjord which cuts off Cape Farewell from the rest of Greenland, and soon came to an Eskimo village on the western coast.

Watkins then returned to England and tried to raise funds for an expedition to cross Antarctica ; but finding this impossible, he decided to return once more to East Greenland and make further investigations round Lake Fjord, which he had decided was the best air-base on the coast.

He proposed to live like an Eskimo for a year, to explore the region round Mount Forel, and possibly to cross the ice-cap in the spring. Watkins had succumbed to the 'call of the North.' "It is queer how it gets hold of one," he wrote:

> The first time a man comes to the Arctic he probably comes half for adventure, half in pursuit of some scientific object. On his first visit he is either scared, and never comes again, or he gets the Arctic in him and returns again and again.

On August 4, 1932, Watkins, with his companions Rymill, Chapman, and Riley, arrived once more at Angmagssalik. A week later they had settled in their base at Lake Fjord. This fjord is Y-shaped, the northern arm being somewhat short and broad. On either side of this arm there are high mountains, and at the head is a 100-foot wall of ice, which marks the end of a glacier. As is usual in such circumstances, the ice-wall frequently 'calves' and sends new-born icebergs shooting down into the fjord, and incidentally creates a considerable tidal wave. The other arm of the fjord is, however, quite safe and ends in a flat expanse of marshy ground, through which meanders a little river flowing from a lake.

The base was set up near the mouth of this river, and the party began to lay in stores of seal, fish, and birds for the winter. Gino, as usual, did most of the hunting, and, in spite of the risks, preferred to hunt alone. This meant that there would be no chance that a less skilled companion would disturb the seals at a critical moment. On August 14 he had a very narrow escape from diaster. He paddled up to within 100 yards of the ice-wall, saw a seal, and harpooned it. He towed it out of the danger-zone, and then climbed out on to an ice-floe with his *kayak* and started to inflate the seal. Suddenly a large piece broke off the glacier. In a flash a great wave came rolling down and dashed the floe against the cliffs. Watkins clung on to a ledge; the *kayak* was overturned and all the hunting-gear carried away. Luckily he managed to collect everything again, and he reached the base without further incident.

A week later, while Rymill and Chapman were surveying the fjord by motor-boat, Watkins went into the danger-zone again. Actually the surveyors did not see Gino pass beyond them because of the ice-floes, and so when, about eleven o'clock, they heard the crash of a big ice-fall from the glacier two miles away, they took no particular notice. Early in the afternoon, when they had crossed into the northern arm of the fjord, they suddenly saw a *kayak* drifting low in the water. The harpoon was in its place, but the throwing-stick and the gun were missing. With fear in their hearts they began to search the ice-floes, and in the middle they found Gino's trousers and *kayak*-belt soaking wet on a flat, irregular floe. Clearly there had been an accident of some sort, but they still hoped that Gino had managed to swim ashore, although this was half a mile away. The wet clothes on the floe remained a mystery, for in spite of a lengthy search, nothing more was seen. They searched till midnight and all the next day, but Gino Watkins had gone as perhaps he would have wished to go, quietly and bravely to his icy grave in the Arctic.

CHARLES E. KEY, *The Story of Twentieth-century Exploration*

ACHIEVEMENT IN THE ALPS

18/5

Mountaineering demands of its followers not only great physical fitness but also the highest mental qualities. The following extract emphasizes the courage, endurance, and determination which are necessary for success in climbing the mighty peaks of the Alps and of other even greater mountain ranges.

Tyndall's account of the ascent of the Weisshorn, in 1861, records a mountaineering feat which was not remarkable for unusual incident. There was no terrible accident such as occurred in the ascent of the Matterhorn a year or two later, or in the attempt on Mount Everest, in 1924, by Mallory and Irvine. The Weisshorn ascent has been chosen as offering a typical example of the sort of difficulty which men have to face in scaling and descending mountain peaks, and of the spirit by which such difficulties are overcome.

Professor Tyndall was a well-known nineteenth-century physicist. He was one of the pioneers of Alpine climbing in the last century, and was the first man ever to ascend the Weisshorn, an achievement performed in the company of two Alpine guides, Bennen and Wenger.

On Friday, the 16th of August, I rose at 4.30; the eastern heaven was hot with the glow of the rising sun, and against it were drawn the mountain outlines. . . . I had sent Bennen [to Randa] to inspect the Weisshorn. On my arrival I learned that he had made the necessary reconnaissance, and entertained hopes of our being able to gain the top.

This noble mountain, which is fourteen thousand eight hundred feet high, had been tried on various occasions and from different sides by brave and competent climbers, but all efforts had been hitherto unavailing.

Previous to quitting Randa to assail this formidable peak I had two pairs of rugs sewed together so as to form two sacks. These and other coverlets, together with our wine and provisions, were sent on in advance of us. At 1 P.M. on the 18th of August Bennen, Wenger, and myself quitted the hotel, and were soon zigzagging among the pines of the opposite mountain. . . .

Two hours' additional climbing brought us to our bivouac, a ledge of rock which jutted from the mountain-side, and formed an overhanging roof. On removing the stones from beneath the ledge, a space of comparatively dry clay was laid bare. This was to be my bed, and to soften it Wenger considerately stirred it up with his axe. This position was excellent, for lying upon my left side I commanded the whole range of Monte Rosa, from the Mischabel to the Breithorn. We were on the edge of an amphitheatre. Beyond the Schallenbach was the stately Mettelhorn. A row of eminences swept round to the right linked by lofty ridges of cliffs, which embraced the Schallenberg glacier. They formed, however, only a spur of the vaster Weisshorn, the cone of which was not visible from our dormitory. In company with Bennen I afterwards skirted the mountain until the whole colossal pyramid stood facing us. When I first looked at it my hopes sank, but both of us gathered confidence from a more lengthened gaze. The mountain is a pyramid with three faces, the intersections of which form three sharp edges or *arêtes*. The end of the eastern ridge was nearest to us, and on it our attention was principally fixed. We finally decided on the route to be pursued next morning, and with a chastened hope in both our breasts we returned to our shelter. . . .

At twelve o'clock I looked at my watch, and a second time at 2 A.M. The moon was then just touching the crest of the Schallenberg, and we were threatened with the withdrawal of her light. This soon occurred. We rose at 2.15 A.M., consumed our coffee, and had to wait idly for the dawn. A faint illumination at length overspread the sky, and with this promise of the coming day we quitted our bivouac at 3.30 A.M. No cloud was to be seen; as far as the weather was concerned we were sure to have fair play. We rounded the shingly shoulder of the mountain to the edge of a snow-field, but before entering upon it I disburthened myself of my strong shooting jacket, leaving it on the mountain-side. The sunbeams and my own exertion would, I knew, keep me only too warm during the day. We crossed the snow, cut our way through a piece of entangled glacier, reached the Bergschrund, and passed it without a rope. We ascended the frozen snow of the couloir[1] by steps, but soon diverged from it to the rocks at our right, and mounted them to the end of the eastern *arête* of the mountain.

A snow saddle separated us from the higher rocks. With our staff-pikes at one side of the saddle, we pass by steps cut upon the other. We find the rocks hewn into fantastic turrets and obelisks, while the loose chips of this sculpture are strewn confusedly upon the ridge. Amid these we cautiously pick our way, winding round the towers or scaling them amain. The work was heavy from the first, the bending, twisting, reaching, and drawing up calling upon all the muscles of the frame. After two hours of this work we halted. . . .

Resuming our gymnastics, [we discovered that] the rocky staircase led us to the flat summit of a tower, where we found ourselves cut off from a similar tower by a deep gap bitten into the mountain. The rope was here our refuge. Bennen coiled it round his waist; we let him down along the surface of the rock, until he fixed himself on a ledge, where he could lend me a helping hand. I followed him, and Wenger followed me. By a kind of screw motion we twisted ourselves round the opposite tower, and reached the ridge behind it. Work of this kind, however, is not to be performed by the day, and, with a view of sparing our strength, we quitted the ridge and endeavoured to get along the southern slope of the pyramid. The mountain was scarred by long couloirs, filled with clear, hard ice. The cutting of steps across these couloirs proved to be so tedious and fatiguing that I urged Bennen to abandon them and try the ridge once more. We regained it and worked along it as before. Here and there upon the northern side the snow was folded over, and we worked slowly upward along the cornice snow. The ridge became gradually narrower, and the precipices on each side more sheer. We reached the end of one of its subdivisions, and found ourselves separated from the next rocks by a gap about twenty yards across. The ridge was here narrowed to a mere wall, which, however, as rock, would present no serious difficulty. But upon the wall of rock was placed a second wall of snow, which dwindled to a pure knife-edge at the top. It was white, of very fine grain, and a little moist. How to pass this snow catenary I knew not, for I did not think a human foot could trust itself upon so frail a support. Bennen's practical sagacity, however, came into play. He tried the snow by squeezing it with his foot, and to my astonishment began to cross it. Even after the pressure of his feet the space he had to stand on did not exceed a hand-breadth. I followed him, exactly as a boy walking along a horizontal pole, with toes turned outwards. Right and left the precipices were appalling. We reached the opposite rock, and an earnest smile rippled over Bennen's countenance as he turned towards me. He knew that he had done a daring thing, though not a presumptuous one. "Had the snow," he said, "been less perfect, I should not have thought of attempting it; but I knew after I had set my foot upon the ridge that we might pass without fear."

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[1] Mountain gully, sometimes filled with ice or snow.

It is quite surprising what a number of things the simple observation made by Faraday in 1846 enables us to explain. Bennen's instinctive act is justified by theory. The snow was fine in grain, pure, and moist. When pressed, the attachments of its granules were innumerable, and their perfect cleanness enabled them to freeze together with a maximum energy. It was this freezing which gave the mass its sustaining power.

After this we found the rocks on the ridge so shaken that it required the greatest caution to avoid bringing them down upon us. With all our care, moreover, we sometimes dislodged vast masses, which leaped upon the slope adjacent, loosened others by their shock, these again others, until finally a whole flight of them would escape, setting the mountain in a roar as they whizzed and thundered along its side to the snowfields 4000 feet below us.

The day was hot, the work hard, and our bodies were drained of their liquids as by a Turkish bath. To make good our loss we halted at intervals where the melted snow formed liquid veins, and quenched our thirst. A bottle of champagne, poured sparingly into our goblets over a little snow, furnished Wenger and myself with many a refreshing draught. Bennen feared his eyes, and would not touch champagne. We, however, did not find halting good; for at every pause the muscles became set, and some minutes were necessary to render them again elastic. But for both mind and body the discipline was grand. There is scarcely a position possible to a human being which, at one time or another during the day, I was not forced to assume. The fingers, wrist, and forearm were my main reliance, and as a mechanical instrument the human hand appeared to me this day to be a miracle of constructive art.

For the most part the summit was hidden from us, but on reaching the successive eminences it came frequently into view. After three hours spent on the *arête*—about five hours, that is, subsequent to starting—we saw the summit over another minor summit, which gave it an illusive proximity.

"You have now good hopes," I remarked, turning to Bennen.

"I do not allow myself to entertain the idea of failure," he replied.

Well, six hours passed on the ridge, each of which put in its inexorable claim to the due amount of mechanical work; and at the end of this time we found ourselves apparently no nearer to the summit than when Bennen's hopes cropped out in confidence. I looked anxiously at my guide as he fixed his weary eyes upon the distant peak. There was no confidence in his expression; still I do not believe that either of us entertained for a moment the thought of giving in. Wenger complained of his lungs, and Bennen counselled him several times to remain behind; but this the Oberland man refused to do.

At the commencement of a day's work one often feels anxious, if not timid; but when the work is very hard we become callous and sometimes stupefied by the incessant knocking about. This was my case at present, and I kept watch lest my indifference should become carelessness. I repeatedly supposed a case where a sudden effort might be required of me, and felt all through that I had a fair residue of strength to fall back upon should such a call be made. This conclusion was sometimes tested by a spurt; flinging myself suddenly from rock to rock, I proved my condition by experiment instead of relying on surmise.

An eminence in the ridge which cut off the view of the summit was now the object of our exertions. We reached it; but how hopelessly distant did the summit appear!

Bennen laid his face upon his axe for a moment; a kind of sickly despair was in his eye as he turned to me, remarking, "Lieber Herr, die Spitze ist noch sehr weit oben."[1]

Lest the desire to gratify me should urge him beyond the bounds of prudence, I told my guide that he must not persist upon my account: that I should cheerfully return with him the moment he thought it no longer safe to proceed. He replied that, though weary, he felt quite sure of himself, and asked for some food. He had it, and a gulp of wine, which mightily refreshed him. Looking at the mountain with a firmer eye, he exclaimed, "Herr! wir müssen ihn haben,"[2] and his voice, as he spoke, rang like steel within my heart. I thought of Englishmen in battle, of the qualities which had made them famous: it was mainly the quality of not knowing when to yield—of fighting for duty even after they had ceased to be animated by hope. Such thoughts helped to lift me over the rocks.

Another eminence now fronted us, behind which, how far we knew not, the summit lay. We scaled this height, and above us, but clearly within reach, a silvery pyramid projected itself against the blue sky. I was assured ten times over by my companions that it was the highest point before I ventured to stake my faith upon the assertion. I feared that it also might take rank with the illusions which had so often beset our ascent, and I shrank from the consequent moral shock. A huge prism of granite, or granitic gneiss, terminated the *arête*, and from it a knife-edge of pure white snow ran up to a little point. We passed along the edge, reached that point, and instantly swept with our eyes the whole range of the horizon. We stood upon the crown of the redoubtable Weisshorn. . . .

We had been ten hours climbing from our bivouac to the

[1] "Dear sir, the summit is still a long way up."

[2] "Sir, we must achieve it."

summit, and it was now necessary that we should clear the mountain before the close of day. Our muscles were loose and numbed, and, unless extremely urged, declined all energetic tension; the thought of our success, however, ran like a kind of wine through our fibres and helped us down. We once fancied the descent would be rapid, but it was far from being so. As in ascending, Bennen took the lead; he slowly cleared each crag, paused till I joined him, I pausing till Wenger joined me, and thus one or other of us was always in motion. . . .

Wenger, who had brought up the rear during the day, is now sent to the front; he has not Bennen's power, but his legs are long and his descent rapid. He scents out the way, which becomes more and more difficult. He pauses, observes, dodges, but finally comes to a dead stop on the summit of a precipice, which sweeps like a rampart round the mountain. We moved to the left, and after a long detour succeeded in rounding the precipice.

Another half-hour brings us to the brow of a second precipice, which is scooped out along its centre so as to cause the brow to overhang. Chagrin was in Bennen's face: he turned his eyes upwards, and I feared mortally that he was about to propose a reascent of the *arête*. It was very questionable whether our muscles could have responded to such a demand.

While we stood pondering here, a deep and confused roar attracted our attention. From a point near the summit of the Weisshorn, a rock had been discharged down a dry couloir, raising a cloud of dust at each bump against the mountain. A hundred similar ones were immediately in motion, while the spaces between the larger masses were filled by an innumerable flight of smaller stones. Each of them shook its quantum of dust in the air, until finally the avalanche was enveloped in a cloud. The clatter was stunning, for the collisions were incessant. Black masses of rock emerged here and there from the cloud, and sped through the air like flying fiends. Their motion was not one of translation merely, but they whizzed and vibrated in their flight as if urged by wings. The echoes resounded from side to side, from the Schallenberg to the Weisshorn and back, until finally, after many a deep-sounding thud in the snow, the whole troop came to rest at the bottom of the mountain. This stone avalanche was one of the most extraordinary things I had ever witnessed, and in connexion with it I would draw the attention of future climbers of the Weisshorn to the danger which would infallibly beset any attempt to ascend it from this side, except by one of its *arêtes*. At any moment the mountainside may be raked by a fire as deadly as that of cannon.

After due deliberation we moved along the precipice westward, I fearing that each step forward but plunged us deeper into difficulty. At one place, however, the precipice bevelled to a steep incline of smooth rock, along which ran a crack, wide enough to admit the fingers, and sloping obliquely down to the lower glacier. Each in succession gripped the rock and shifted his body sideways along the crack until he came near enough to the glacier to reach it by a rough glissade. We passed swiftly along the glacier, sometimes running, and, on steeper slopes, sliding, until we were pulled up for the third time by a precipice which seemed even worse than either of the others. It was quite sheer, and as far as I could see right or left altogether hopeless.

To my surprise, both men turned without hesitation to the right.[1] We looked over the brink at intervals, and at length discovered what appeared to be a mere streak of clay on the face of the precipice. On this streak we found footing. It was by no means easy, but to hard-pushed men it was a deliverance. The streak vanished, and we must get down the rock. This fortunately was rough, so that by pressing the hands against its rounded protuberances, and sticking the boot-nails against its projecting crystals, we let ourselves gradually down. A deep cleft separated the glacier from the precipice; this was crossed, and we were free, being clearly placed beyond the last bastion of the mountain.

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[1] They had, on a previous examination of the mountain, seen a chamois descending here, and made a note of its route.

JOHN TYNDALL, *Hours of Exercise in the Alps*

MAN AGAINST MOUNTAIN

1815

MANY attempts have been made to climb Mt Everest, the highest mountain in the world, but it still remains unconquered.

One of the most dramatic of these attempts was that of the expedition of 1924, when two climbers, Mallory and Irvine, were seen by a companion to reach a height of at least 28,000 feet before being lost to sight in a swirling mist. It is even possible that they reached the top. But they were never seen again; and the only trace of them that has been found was an ice-axe, discovered nine years later by two other mountaineers on a ledge 28,000 feet high.

Mountaineering tragedies are sometimes the result of foolhardiness, when reckless amateur climbers attempt feats which they have not the skill to achieve. But this was not the case with Mallory and Irvine. They were both picked men. George Leigh Mallory was one of the most experienced climbers of his day and had been on two previous Everest expeditions, showing both skill and resolution. In an unsuccessful attempt made in 1922, when a party reached the then record height of 26,800 feet (without oxygen) and were overtaken by darkness on the way down, it was Mallory who did most of the leading. One of the party had fallen sick, and was saved by this daring night descent, in which they had only a candle in a lantern to light their steps. Mallory's work on this occasion was described by the leader of the expedition, General Bruce, as "one of the greatest feats of human endurance in any field of activity."

Andrew Irvine was not, like his companion, an experienced climber; but he was a young man of exceptionally fine physique and had taken part in two Oxford University Arctic Expeditions. He had sacrificed his place in the Oxford boat crew of that year in order to accept the invitation to join the expedition.

The story of Mallory and Irvine's splendid attempt is told here by Captain Noel, the official photographer of the expedition. Just previous to this attempt, two other members of the party had made a great effort to reach the summit without using oxygen, but had been forced to give up.

NORTON and Somervell had shot their bolts. Mallory and Irvine now took up the fight, aided by oxygen. Norton said, "There is no doubt Mallory knows he is leading a forlorn hope."

I had an opportunity of observing Mallory closely, as I was at Snowfield Camp during this time, and I formed the positive opinion that physically he had become an unfit man. His bitter but suppressed disappointment over the continual setbacks and the ill luck of the weather this year was manifest, but so also was his burning ambition. It was his spirit that was sending him again to the attack. He had his teeth in the job and he meant business. He was throwing his last ounce of strength into this fight.

Only two men were to make the assault. Mallory, of course, was to be the leader. It was his theory that two make the best climbing party ; furthermore, the high-going porters were so reduced that camp equipment for two climbers at the most could be carried. For companion there were only two to choose from, Irvine and Odell, because these two were the oxygen experts. Mallory chose Irvine, with Odell and Hazard in support at the higher camps. Irvine had virtually taken charge of the oxygen apparatus. He had been working hard during Norton and Somervell's climb and had completed two sets, with a third in reserve. He was anxious and worried about the machines ; and, I think, the anxiety told heavily on him because he also was far from being in good condition. He breathed heavily and with labour. We all noticed it.

Odell stood altitude and acclimatized perhaps better than anybody else on the Expedition. He was never ill, never seemed tired; always kept an even, placid temperament unruffled by any event whatsoever. Geology kept him happy the day long. He wandered up and down the North-east Ridge and across the face of Everest, reaching 25,000 and 26,000 feet apparently without particular effort. He remained longer than any up at Ice Cliff Camp. He had been slower than any other of the men to acclimatize, but eventually he appeared to become inured to a greater degree. For an Everest climber he seems to be the perfection of type.

Many people now consider it was a pity Mallory did not take him on his final spurt, making his party one of three instead of two. But the reasons against that course have been given—the difficulties of the transportation of camp equipment for a third man to Highest Bivouac (Mallory intended this time to move Highest Bivouac up another 500 feet to 27,000 feet), and the necessity of leaving behind a supporting party at the Ice Cliff and Windy Ridge 25,000-feet Depots. Such a chain of support is vital on Everest. The ideal 'Polar method' would have a support party of two fit men at each stage; we had only Hazard and Odell for this support work. . . .

The season was late, the date when the monsoon usually breaks had passed, but fortunately the weather was still clear and almost ideal. The days were warm and fine, the snow and ice in good condition, and the wind moderate.

Mallory and Irvine succeeded in three stages in establishing their highest bivouac at the shoulder, 500 feet higher than any of the previous parties had done. From "Eagle's Nest" I photographed them on the way up, at 26,000 feet. I then went for one afternoon to Ice Cliff Camp; the same day they went up to 27,000 feet; and that evening I received the note I have already spoken of—the last letter Mallory ever wrote.

His message told me to look out for him next morning at a certain place on the summit ridge which he had previously discussed and arranged with me. I spoke to Lakpa, who brought me the note and who was one of the few porters to attain 27,000 feet. He said that the Sahibs were well and the weather was good, and that they had successfully reached the higher level. After building the camp the Sahibs had sent the porters down. That evening Lakpa and his companions and my own photographic porters descended to Snowfield Camp. Lakpa had thus that day climbed with a 20 lb. load from 25,000 feet to 27,000 feet and descended from 27,000 feet to 21,000 feet—a great performance. He was one of the three best of the whole porter corps.

Next morning at daybreak I set up my motion-picture camera with a long lens trained on the summit pyramid, three miles distant, to watch for Mallory and Irvine on that last terrible trail. I had two keen-eyed men watching in turns, their eyes glued continuously to the telescope, but they saw nothing. 8 A.M. went by, then 10 A.M., and clouds and mist then obscured the whole summit ridge.

Norton was still in his tent suffering from his snow-blindness. Bruce, Hingston, and I were at the camp. Odell and Hazard were based at Ice Cliff Camp and Windy Ridge 25,000 feet Camp. Mallory's note and verbal messages to us had cheered us; and we were all optimistic over their success in establishing the 27,000-feet Depot. Should they have passed a good night there and have started well before dawn (Mallory was always an early starter), there was a distinct chance they might gain the top that day.

This was the historic climax of our adventure—glorious because of the marvel of attainment, sad because of the tragedy of death.

For Mallory and Irvine had gone for ever from our sight. Up and up into the blue they had gone higher and higher—

higher than men have ever reached before. Odell got a single fleeting glimpse of them within 600 feet of the summit and still going up. Then he saw nothing more. What happened no one knows. They never came back.

I will relate all that any of us, who waited and watched and searched, and waited again during the next anxious and awful days, knows.

Hour after hour we watched the mountain with our telescopes for what we might see through the mists. The men were a day and a night overdue. We knew nothing. There was no message even from the support party. Had they slipped and been hurled down the 10,000-feet precipice? Perhaps, the summit attained, they had found themselves too exhausted to reach camp by nightfall and had been frozen to death? The silence of the support party meant, we hoped, that they had gone out to search. We could only hope against hope that they would find the two men alive and would bring them down.

To catch the spirit of that tragic time you must realize the terrible state of body and mind that comes upon men in these high altitudes, with the air so rarefied that it can scarcely support life, although the wind blows at tremendous velocities. After every effort hearts go pounding until they are in agony; and each spell of toil demands long periods of rest. Worst of all is the state of mind. Men fall into an almost ghastly psychological condition.

Think of what the effort had cost those already tired men struggling towards the pinnacle. Think also of us; our initial joy and expectation sinking into as deep a dejection and anxiety when every fresh hour brought the certainty of disaster and death more overwhelmingly upon us. How we had desired victory! Did we not deserve it? This was the third time we had returned to the task.

Two whole days and nights had now gone by, with hope fading at every hour. Norton, recovered sufficiently from snow-blindness, paced backwards and forwards in front of his tent, speaking little, visibly affected and, I think, already resigned to the worst. Hingston had all his medical aids ready and was prepared to go out at once in answer to a call from the support party up on the mountain. I had left my photographic station on the Cliff above the camp and now had my men posted at my telescope erected in the middle of Snowfield Camp. The men took it in turns to scan the mountain during every hour and moment of daylight. Norton, Bruce, Hingston, and I sat about near the little Whymper tent we used for the mess. Now and then we called over to the watchers on the telescope, "Kutch Dekta ?"—"Do you see anything ?" The men turned and shook their heads each time : "Kutch Nahin, Sahib"—"Nothing at all, sir." Then I would at intervals go to the telescope and scan the mountain myself to make certain. The days were fine and the sun shone, although up on the mountain the never-ceasing wind and mist were blowing ; and in the distance in the southern sky over the Rapui La banks of cloud were collecting and rolling up. They told that the monsoon had reached Bengal and would soon sweep up here to break and obliterate everything.

Suddenly our watchers at the telephone called out that they saw figures on the crest of the Ice Cliff !

We riveted our eyes to the cliff-top. We saw through the telescope distinctly a line of men returning and entering the camp. (The tents on the ice shelf could just be seen from Snowfield Camp.) It was Odell with his support party. Presently we saw figures come out to the edge of the shelf. They were coming to make a signal to us. We used to communicate between the camps over the space of a mile by signals ; and Norton had arranged with the support party a series by which to tell us their news. As we watched we again hoped, against hope, that they would tell us they had found the men—frost-bitten—exhausted—incapable of moving—anything, but still alive. While life existed we could go to the rescue and do our best and utmost. What would the signal be? Life, or——? I saw them place six blankets in the form of a cross. Then they went away. This was the signal of DEATH.

I remember the moment vividly. I saw this signal through my telescope as I was making the photograph of the scene through my high-powered magnifying lens. An electric battery was operating the camera. I was so agitated to read the message that I could hardly have turned the handle of the camera myself. Bruce asked me what I saw. I saw plainly it was a cross, but had not the heart to answer him. I handed him the telescope that he might look for himself. We all looked. We all tried to make it different. But it was plainly a cross on the white snow.

Norton called a conference and discussed many things. A further search—a new search-party: the futility of it, since no men so long overdue could possibly be still alive; the project of searching the glaciers below the precipice for their bodies: the hopelessness of that task in such a vast area; what cable message should we at once send home; the approaching monsoon, and the safety of Odell and Hazard and their men: the advisability of withdrawing them at once down the Ice Cliff that becomes so treacherous in bad weather—and a hundred other thoughts.

In the end Norton ordered an answering signal to be made; and Hingston had the task of doing it. He went out on the glacier just beyond the tents and placed three lines of blankets spaced apart. It said to those on the Cliff above: "Abandon hope and come down." It was all over. Soon Odell and Hazard would be with us; and then they would tell us details. We sat down and waited for them to come.

That night, our party reunited, Odell told us the whole tale—a thrilling tale because of the magnificent attainment of Mallory and Irvine as last seen by him, and because of the heroism of Odell himself in the terrific efforts he made to find them.

To Odell must fall the honour and praise for doing the utmost that any man could do. Twice he went in search to 27,000 feet, the last time alone, because the others with him had fallen exhausted. I will recount his story as he told it to us himself, to the best of my remembrance, it being now three years ago.

"On the day Mallory and Irvine were to make the attempt on the summit, I went up to the 25,000-feet Depot to be in close support of them. I was geologizing on the way, and I made short trips in the neighbourhood of the camps.

"At about half-past twelve there was a sudden clearing of the atmosphere; and the entire summit of Everest was unveiled. A belt of driving mist sweeping across the northern face failed to reach as far as the summit and left the final pyramid standing out clear against the blue sky. Suddenly I noticed high up in the almost perpendicular wilderness a moving black speck silhouetted on the second step, then I saw another speck move up to join the first. It was no other than Mallory and Irvine within 600 feet of the summit. They seemed to be going strong. I dropped my geologizing, took out my glasses and riveted my attention on the spot. The wind was tearing round me. Then the mist swept up and the whole fascinating vision vanished. I waited and watched again, but the mist never cleared, although, I think up where they were there was little or no mist. But that was all I saw. When I last saw them they were going strong. The sight gave me the first impression that they were going to reach the top.

"It was so late when I had seen them at the second step—a good four hours behind their schedule time—that my fear was of their being overtaken by the night in the descent. I expected that to return to the 27,000-feet bivouac would be the utmost they could do that night. Next day I went up to the 27,000-feet Depot, taking two of the Sherpas with me, hoping to meet Mallory and Irvine coming down. At last I reached 27,000 feet and found their camp. I approached the tents and called out, but there was no answer. I went up and looked in. The tents were empty.

("I and the porters were in a state of exhaustion, and we could not stay up there. I then found a white background and made a signal to Hazard at the Ice Cliff below. We went back to the 25,000-feet camp; and I spent a night of terrible anxiety. Next morning I found the two porters were incapable of going up again to 27,000 feet and I was in an exhausted state myself, but with oxygen—and there was the third spare apparatus here—I thought I could do the climb again. Accordingly I struggled up to 27,000 feet again, but alone, leaving the porters behind. I hoped that Mallory and Irvine might perhaps have got back that night and I might find them in the tents. I could then look after them and signal down for help. I dragged myself up to the two tents, which I found standing as before. I went to them and pulled the flaps of the tents apart and looked in. They were empty. The two men must have perished. There was no trace of them. There was no written message left by either of them. I looked at everything. It was beyond my power to search higher up the mountain. The men had been missing from their camp for two nights and they could not possibly survive. I made my way down and reached the Ice Cliff, where we put out the signal to you—that was all I was able to do."

Then Odell added :)

"I think that it is quite possible and even likely that Mallory and Irvine reached the top and were overtaken by the night in the descent, exhausted and frozen to death."

Such was the simple, heroic, and tragic story Odell told us. It was then that we realized to the bitter full how hard and how cruelly this mountain fights. She had allowed the men to come on, and at the last moment had killed them. Maybe she had killed them in revenge after they had attained their victory. Who knows? She alone holds the secret.[1]

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[1] It has been suggested by later Everest climbers that what Odell saw was really two rocks in the snow; by an optical illusion these might give the appearance of movement seen from a great distance. Odell, however, is convinced that he was not mistaken.

CAPTAIN J. B. L. NOEL, *Through Tibet to Everest*

THE LADY OF SCUTARI

DURING the Crimean War readers of *The Times* were shocked to read a series of despatches from the paper's correspondent, W. H. Russell, telling of the appalling neglect which the British wounded were suffering. "The manner in which the sick and wounded have been treated," he wrote in one dispatch, "is worthy only of the savages of Dahomey. Numbers arrived at Scutari (the hospital town) without having been touched by a surgeon since they fell, pierced by Russian bullets, on the slopes of Alma. The ship was literally covered by prostrate forms. . . . The worst cases were placed on the upper deck, which, in a day or two, became a mass of putridity. The neglected gunshot wounds bred maggots which crawled in all directions, infecting the food of the unhappy beings on board."

Among those who were horrified at the state of affairs in the Crimea was Florence Nightingale, a lady of good family and position who had for some years been studying hospital conditions and nursing, feeling a call for some such noble outlet for her energies. On reading of the disgraceful conditions prevailing at Scutari she wrote to Sidney Herbert, the War Minister, who was a personal friend, offering her services. By the same post he had written to her asking if she would go out to organize a nursing system.

The story of the magnificent work which she accomplished is here told by a distinguished author and critic, Lytton Strachey.

AT Scutari, the landing-stage, constructed with all the perverseness of Oriental ingenuity, could only be approached with great difficulty, and, in rough weather, not at all. When it was reached, what remained of the men in the ships had first to be disembarked, and then conveyed up a steep slope of a quarter of a mile to the nearest of the hospitals. The most serious cases might be put upon stretchers—for there were far too few for all; the rest were carried or dragged up the hill by such convalescent soldiers as could be got together, who were not too obviously infirm for the work. At last the journey was accomplished; slowly, one by one, living or dying, the wounded were carried up into the hospital. And in the hospital what did they find?

"Lasciate ogni speranza, voi ch'entrate"[1]: the delusive doors bore no such inscription; and yet behind them Hell yawned. Want, neglect, confusion, misery—in every shape and in every degree of intensity—filled the endless corridors and the vast apartments of the gigantic barrack-house, which, without forethought or preparation, had been hurriedly set aside as the chief shelter for the victims of the war. The very building itself was radically defective. Huge sewers underlay it, and cesspools loaded with filth wafted their poison into the upper rooms. The floors were in so rotten a condition that many of them could not be scrubbed; the walls were thick with dirt; incredible multitudes of vermin swarmed everywhere. And, enormous as the building was, it was yet too small. It contained four miles of beds, crushed together so close that there was but just room to pass between them. Under such conditions, the most elaborate system of ventilation might well have been at fault; but here there was no ventilation. The stench was indescribable. "I have been well acquainted," said Miss Nightingale, "with the dwellings of the worst parts of most of the great cities in Europe, but have never been in any atmosphere which I could compare with that of the Barrack Hospital at night." The structural defects were equalled by the deficiencies in the commonest objects of hospital use. There were not enough bedsteads; the sheets were of canvas, and so coarse that the wounded men recoiled from them, begging to be left in their blankets; there was no bedroom furniture of any kind, and empty beer-bottles were used for candlesticks. There were no basins, no towels, no soap, no brooms, no mops, no trays, no plates; there were neither slippers nor scissors, neither shoe-brushes nor blacking; there were no knives or forks or spoons. The supply of fuel was constantly deficient. The cooking arrangements were preposterously inadequate, and the laundry was a farce. As for purely medical materials, the tale was no better. Stretchers, splints, bandages—all were lacking; and so were the most ordinary drugs.

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[1] All hope abandon, ye who enter here.

To replace such wants, to struggle against such difficulties, there was a handful of men overburdened by the strain of ceaseless work, bound down by the traditions of official routine, and enfeebled either by old age or inexperience or sheer incompetence. . . .

Miss Nightingale came, and she, at any rate, in that Inferno, did not abandon hope. . . .

Her position was indeed an official one, but it was hardly the easier for that. In the hospitals it was her duty to provide the services of herself and her nurses when they were asked for by the doctors, and not until then. At first some of the surgeons would have nothing to say to her, and, though she was welcomed by others, the majority were hostile and suspicious. But gradually she gained ground. Her good will could not be denied, and her capacity could not be disregarded. With consummate tact, with all the gentleness of supreme strength, she managed at last to impose her personality upon the susceptible, overwrought, discouraged, and helpless group of men in authority who surrounded her. She stood firm; she was a rock in the angry ocean; with her alone was safety, comfort, life. And so it was that hope dawned at Scutari. The reign of chaos and old night began to dwindle; order came upon the scene, and common sense, and forethought, and decision, radiating out from the little room off the great gallery in the Barrack Hospital where, day and night, the Lady Superintendent was at her task. Progress might be slow, but it was sure. The first sign of a great change came with the appearance of some of those necessary objects with which the hospitals had been unprovided for months. The sick men began to enjoy the use of towels and soap, knives and forks, combs and tooth-brushes. Dr Hall [the chief medical officer] might snort when he heard of it, asking, with a growl, what a soldier wanted with a tooth-brush; but the good work went on. Eventually the whole business of purveying to the hospitals was, in effect, carried out by Miss Nightingale. She alone, it seemed, whatever the contingency, knew where to lay her hands on what was wanted; she alone could dispense her stores with readiness; above all she alone possessed the art of circumventing the pernicious influence of official etiquette. This was her greatest enemy, and sometimes even she was baffled by it. On one occasion 27,000 shirts, sent out at her instance by the Home Government, arrived, were landed, and were only waiting to be unpacked. But the official "Purveyor" intervened; "he could not unpack them," he said, "without a Board." Miss Nightingale pleaded in vain; the sick and wounded lay half-naked, shivering for want of clothing; and three weeks elapsed before the Board released the shirts. A little later, however, on a similar occasion, Miss Nightingale felt that she could assert her own authority. She ordered a Government consignment to be forcibly opened, while the miserable "Purveyor" stood by, wringing his hands in departmental agony.

Vast quantities of valuable stores sent from England lay, she found, engulfed in the bottomless abyss of the Turkish Customs House. Other ship-loads, buried beneath munitions of war destined for Balaclava, passed Scutari without a sign, and thus hospital materials were sometimes carried to and fro three times over the Black Sea, before they reached their destination. The whole system was clearly at fault, and Miss Nightingale suggested to the home authorities that a Government Store House should be instituted at Scutari for the reception and distribution of the consignments. Six months after her arrival this was done.

In the meantime she had reorganized the kitchens and the laundries in the hospitals. The ill-cooked hunks of meat, vilely served at irregular intervals, which had hitherto been the only diet for the sick men were replaced by punctual meals, well-prepared and appetizing, while strengthening extra foods—soups and wines and jellies ("preposterous luxuries," snarled Dr Hall)—were distributed to those who needed them. One thing, however, she could not effect. The separation of the bones from the meat was no part of official cookery: the rule was that the food must be divided into equal portions, and if some of the portions were all bone—well, every man must take his chance. The rule, perhaps, was not a very good one; but there it was. "It would require a new Regulation of the Service," she was told, "to bone the meat." As for the washing arrangements, they were revolutionized. Up to the time of Miss Nightingale's arrival the number of shirts the authorities had succeeded in washing was seven. The hospital bedding, she found, was 'washed' in cold water. She took a Turkish house, had boilers installed, and employed soldiers' wives to do the laundry work. The expenses were defrayed from her own funds and that of *The Times*; and henceforward the sick and wounded had the comfort of clean linen.

Then she turned her attention to their clothing. Owing to military exigencies the greater number of the men had abandoned their kit; their knapsacks were lost for ever; they possessed nothing but what was on their persons, and that was usually only fit for speedy destruction. The "Purveyor," of course, pointed out that, according to the regulations, all soldiers should bring with them into hospital an adequate supply of clothing, and he declared that it was no business of his to make good their deficiencies. Apparently it was the business of Miss Nightingale. She procured socks, boots, and shirts in enormous quantities; she had trousers made, she rigged up dressing-gowns. "The fact is,"she told Sidney Herbert, "I am now clothing the British Army."

All at once, word came from the Crimea that a great new contingent of sick and wounded might shortly be expected. Where were they to go? Every available inch in the wards was occupied; the affair was serious and pressing, and the authorities stood aghast. There were some dilapidated rooms in the Barrack Hospital, unfit for human habitation, but Miss Nightingale believed that if measures were promptly taken they might be made capable of accommodating several hundred beds. One of the doctors agreed with her; the rest of the officials were irresolute: it would be a very expensive job, they said; it would involve building; and who could take the responsibility? The proper course was that a representation should be made to the Director-General of the Army Medical Department in London; then the Director-General would apply to the Horse Guards, the Horse Guards would move the Ordnance, the Ordnance would lay the matter before the Treasury, and, if the Treasury gave its consent, the work might be correctly carried through, several months after the necessity for it had disappeared. Miss Nightingale, however, had made up her mind, and she persuaded Lord Stratford[1]—or thought she had persuaded him—to give his sanction to the required expenditure. A hundred and twenty-five workmen were immediately engaged, and the work was begun. The workmen struck; whereupon Lord Stratford washed his hands of the whole business. Miss Nightingale engaged two hundred other workmen on her own authority, and paid the bill out of her own resources. The wards were ready by the required date; five hundred sick men were received in them; and all the utensils, including knives, forks, spoons, cans, and towels, were supplied by Miss Nightingale.

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[1] Lord Stratford de Redcliffe was British Ambassador at Constantinople.

This remarkable woman was in truth performing the function of an administrative chief. How had this come about? Was she not in reality merely a nurse? Was it not her duty simply to tend the sick? And indeed, was it not as a ministering angel, a gentle 'lady with a lamp,' that she actually impressed the minds of her contemporaries? No doubt that was so; and yet it is no less certain that, as she herself said, the specific business of nursing was "the least important of the functions into which she had been forced." It was clear that in the state of disorganization into which the hospitals at Scutari had fallen, the most pressing, the really vital, need was for something more than nursing; it was for the necessary elements of civilized life—the commonest material objects, the most ordinary cleanliness, the rudimentary habits of order and authority. "Oh, dear Miss Nightingale," said one of her party as they were approaching Constantinople, "when we land, let there be no delays, let us get straight to nursing the poor fellows!" "The strongest will be wanted at the wash-tub," was Miss Nightingale's answer. And it was upon the wash-tub, and all that the wash-tub stood for, that she expended her greatest energies. Yet to say that is perhaps to say too much. For to those who watched her at work among the sick, moving day and night from bed to bed, with that unflinching courage, with that indefatigable vigilance, it seemed as if the concentrated force of an undivided and unparalleled devotion could hardly suffice for that portion of her task alone. Wherever, in those vast wards, suffering was at its worst and the need for help was greatest, there, as if by magic, was Miss Nightingale.

Her super-human equanimity would, at the moment of some ghastly operation, nerve the victim to endure and almost to hope. Her sympathy would assuage the pangs of dying and bring back to those still living something of the forgotten charm of life. Over and over again her untiring efforts rescued those whom the surgeons had abandoned as beyond the possibility of cure. Her mere presence brought with it a strange influence. A passionate idolatry spread among the men: they kissed her shadow as it passed. They did more. "Before she came," said a soldier, "there was cussin' and swearin', but after that it was as 'oly as a church." The most cherished privilege of the fighting man was abandoned for the sake of Miss Nightingale. In those "lowest sinks of human misery," as she herself put it, she never heard the use of one expression "which could distress a gentlewoman."

She was heroic; and these were the humble tributes paid by those of grosser mould to that high quality. Certainly, she was heroic. Yet her heroism was not of that simple sort so dear to the readers of novels and the compilers of hagiologies—the romantic, sentimental heroism with which mankind loves to invest its chosen darlings: it was made of sterner stuff. To the wounded soldier on his couch of agony she might well appear in the guise of a gracious angel of mercy; but the military surgeons, and the orderlies, and her own nurses, and the "Purveyor," and Dr Hall, and even Lord Stratford himself could tell a different story. It was not by gentle sweetness and womanly self-abnegation that she had brought order out of chaos in the Scutari Hospitals, that, from her own resources, she had clothed the British Army, that she had spread her dominion over the serried and reluctant powers of the official world; it was by strict method, by stern discipline, by rigid attention to detail, by ceaseless labour, by the fixed determination of an indomitable will.

LYTTON STRACHEY, *Eminent Victorians*

HUMANITY AND WAR

While the American forces were attacking the German-held citadel of Saint Malo in Brittany in August 1944, the German commander sent an appeal to his opponents. There were many wounded lying stacked in the tunnels running beneath the fort, but there were practically no medical supplies. Could the Americans help?

On the face of it nothing could be more absurd than that men who are fighting each other to the death should call a brief truce in order that one side may give aid to the other. None the less the Americans responded to the appeal. A jeep was fitted up with bandages, splints, and drugs, and driven to the edge of the defensive minefield. From one of the tunnel entrances came fourteen men, half of them blindfolded—these were American prisoners. The supplies were handed over to the German medical officer and the orderlies accompanying him. Then the officer ordered his men to unbandage the prisoners, and said to them, "You are free." He saluted, and led his men back with the supplies to the tunnel. A few minutes later the silenced guns opened up again, and death hovered once more over the fortress.

It is easy to be baffled, even irritated, by such contradictions as this. Yet, though we may feel that it is tragically absurd that men should deal out death with one hand and offer succour with the other, we may also feel a sense of relief that some gleams of human feeling, illogical though they may be, are allowed to shine through the darkness of war.

The development of man's interest in and care for the suffering victims of war makes a bright page in a grim story. This interest is perhaps first seen in the founding of the Order of the Knights of St John. The nucleus of this order was a hospital run by Christian monks in Jerusalem during the First Crusade at the end of the eleventh century. Nearly four and a half centuries later the Knights settled in Malta, which has since become inseparably connected with their name. The symbol of the order was an eight-pointed white cross, now known as the Maltese cross; and this emblem may still be seen on the uniforms of the admirable St John Ambulance workers.

Many attempts were made in the centuries following the Crusades to come to agreement about the humane treatment of war-wounded. But it was not until 1742 that a really effective treaty on the matter was drawn up between two warring nations. These were Great Britain and France; and the clauses of the treaty were so comprehensive that one can only feel that it was a pity that nations so alive to humane feeling could not have gone a little further and avoided the war. Nor was this treaty a mere scrap of paper, as too many later treaties have been. After the battle of Dettingen in 1743 its clauses were duly honoured, and the wounded, irrespective of nationality, humanely treated by both sides.

Just over a hundred years later we meet the most distinguished of all pioneers of war-time medical organization—Florence Nightingale. To her, more than to anyone, we in Britain owe it that the treatment of wounded has developed from an unplanned, haphazard, incompetent business to a carefully organized system of medical treatment and intelligent nursing. The story of her achievements in the Crimean War will always remain her chief monument. Yet her work did not finish when the war was over and the last troops had returned. Her appetite for reform was increased, not diminished, and to the end of the century she laboured in her chosen calling as the friend of the sick and suffering.

The value of Miss Nightingale's work lay not only in her own great reforms. Her activities were an inspiration to others; and to none more usefully than to Henri Dunant, a Swiss banker.

Three years after the close of the Crimean war Dunant was on holiday in the Italian town of Castiglione. The bloody battle of Solferino had just been fought between the armies of Italy and France on the one side and Austria on the other. Castiglione became a kind of centre for the reception of the wounded; but any arrangements that had been made for their care soon completely collapsed. Suffering men lay mutilated and unattended in and around the town, their wounds black with flies. Some were taken into private houses; others were brought, or staggered on their own, to the shelter of the churches; yet others just lay in the roads.

Dunant was a banker, not a doctor; he was a Swiss, and the wounded combatants were Frenchmen and Italians or captured Austrians. The matter was really no concern of his. But he was drawn to the scene, first perhaps by curiosity, then by an intense horror of the chaos and misery by which he was surrounded. He became inspired by humanitarian zeal. Though he had no official position whatever, he automatically assumed an authority which was accepted because it was so badly needed. He sent a messenger to a near-by town to buy, at Dunant's own expense, supplies of some of those things which were most required—sponges, linen, tobacco, lemons, and camomile for washing the wounds. For three days and nights he went among the wounded, encouraging the mere handful of doctors, offering comforts and sympathy where he could, and organizing every one he could find—tourists, Austrian prisoners, slightly wounded soldiers, and the women of Castiglione—into a band of helpers and nurses.

It was a task both splendid and terrible. In a letter appealing for assistance to an acquaintance he poured out his heart:

> Every fifteen minutes for three days I have seen a human

> being die in unimaginable agonies. A glass of water, a cigar, a friendly smile—and they become changed natures, suffering the hour of death bravely and calmly. Pardon, but I am weeping continuously as I write. I must close. They are calling me.

And to another correspondent:

> Never shall I be able to forget the eyes of these victims who wished to kiss my hand. It was shocking. The poor French soldier, so brave in danger, so patient in suffering, and so grateful for a glass of water! The appearance of the battlefield is nothing compared with the despair of the poor wretches who lay in heaps, one, two, even three days without care, without help, believing themselves abandoned. I have seen old soldiers, brave *zouaves*, who cried like children. It would break your heart. In the corner of the churches I found many who had simply been forgotten, others who for days had been brought nothing to eat or drink. Many, despite their terrible wounds, had never been bandaged, men whom a little quicker assistance might have saved. . . . There they lay on the stones or on straw, pieces of which stuck in their wounds.

Such scenes burned impressions which could never be effaced from the young banker's mind, and which were to leave a lasting effect on the future battlefields of Europe. Henri Dunant, a private citizen of no particular renown or importance, was soon to alter the face of war in almost every part of the world.

The horrors he had experienced would not let him rest. He was seized by an urge familiar to many other men whose minds have been filled by unforgettable experiences—an urge to ease the mind by creative expression. He sat down and wrote. "The deep and pain-filled shock of Solferino," he tells us, "must be transmitted in this brief account, which would truthfully record what my own eyes have seen." The result was *Un Souvenir de Solferino*, a book inspired as few books ever are. It was originally intended only for the private reading of his acquaintances, but its wider circulation was inevitable.

The book was not merely the story of his experiences. He wanted to know if something could not be done to prevent a repetition of such tragic neglect of wounded men, and to organize and prepare the kind of assistance he and his helpers had been giving at Castiglione without preparation. He had, moreover, a practical remedy to propose.

> Is it not possible to found relief societies in all countries in peace-time with a view to having the wounded, without distinction of nationality, cared for in war-time by volunteers who are well prepared for such work? . . . Societies of this sort, if they were once permanently established, would be completely ready at the moment war was declared. In every country they must include the most respected and distinguished men as members of their leading committees. They would issue an appeal to everyone who, impelled by a feeling of true humanity, might be willing to devote himself at once to this welfare work. . . . Such an appeal should be addressed to both men and women, to the powerful princess on her throne, and to the faithful servant, to the poor solitary widow, to every one who will devote his last ounce of strength to alleviating the sufferings of his fellow men.

He wished to see a congress held at which some international principle would be agreed upon as the basis of a system of relief for the wounded in the different countries of Europe. Humanity and civilization, he insisted, demanded some such action as this.

Idealists are not always mere idle dreamers: sometimes they are wise pioneers of progress. The suggestions in Dunant's book were essentially practical. A committee of five was set up in Geneva by a private body, the Public

Welfare Society, to consider them: it consisted of Dunant himself, Gustave Moynier, a lawyer and President of the Welfare Society, General Dufour, the Commander-in-chief of the Swiss army, and two doctors. This small group developed into the International Red Cross Committee, and was the nucleus of the vast organization which now extends to every part of the world its amazing services to the wounded and to prisoners-of-war.

The efforts of the committee, supported by Dunant's personal visits to distinguished men and women all over Europe, led to the holding of International Diplomatic Conferences at Geneva in 1863 and 1864. At these conferences was drafted the famous Geneva Convention, by which the twenty-six nations[1] represented agreed to respect the neutrality of those having care of the wounded, and to refrain from firing upon buildings or transport used for their protection. An international symbol was agreed upon to enable such people, buildings, and equipment to be easily distinguished: this symbol was the Swiss flag reversed, chosen in compliment to Dunant and to the country which, more than any other, had taken the lead in fostering the conferences. The Swiss flag is a white cross on a red background; and so we have the familiar red cross, which to millions of people speaking a score of different tongues now stands as the symbol of healing.

Since the founding of the initial Red Cross Committee by Dunant and his colleagues, the movement has spread like a flood. National Red Cross Societies sprang up in country after country: there are now more than sixty of them. In 1919 a League of Red Cross Societies was formed to develop the humanitarian activities of the Red Cross in peace-time by the relief of suffering and the prevention of disease. There is also a Junior Red Cross, numbering over ten million members in all countries.

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[1] Subsequently almost every country in the world accepted the convention, which was revised in 1906.

It was ironical, but perhaps not unexampled among other pioneers, that as the institution which Dunant had founded grew in fame, so he himself sank into obscurity. At the close of the century, the man whose unselfish efforts had brought untold relief to hundreds of thousands was discovered living in one room of an almshouse on three francs a day, an old man, forgotten. That he himself did not seek or desire fame did not relieve his fellow-men of the responsibility for showing their gratitude. To the credit side of humanity's account can be placed the fact that the Empress of Russia granted him a pension for life, and that he now received half of the first Nobel Peace Prize and other honours. Even so, how many of the vast army of war-victims who have benefited from the activities of the Red Cross know even the name of the man to whose pioneer labours they owe their relief?

G. F. L.

THE HERO OF MOLOKAI

The leper was once an unhappily familiar sight in European towns. The sound of his bell and his ghastly cry, "Unclean!" drove his more fortunate fellows from his path in horror, until society adopted the saner and more humane policy of isolating him.

Though leprosy has to-day been all but banished from Europe, it is still fairly prevalent in certain parts of the world, such as India and Africa. Even the glamorous islands of the South Seas are not free from its scourge. One of these islands, Molokai, was made into a leper settlement in 1865, and all sufferers in Hawaii were deported to it and left there to live like beasts among themselves.

About this time a Roman Catholic priest from Belgium, Father Joseph Damien, arrived in Honolulu. In due course, hearing of the unhappy island of Molokai, he persuaded his bishop to allow him to go to minister to its inhabitants, though he knew that by doing so he would cut himself off for ever from the outside world.

The story of his heroic efforts is here told by the late Sir Arthur Quiller-Couch, for many years a Professor of English Literature at Cambridge, and author of such novels as *Poison Island* and *The Splendid Spur*.

The Hawaiian or Sandwich Islands lie out in the North Pacific Ocean, almost 2000 miles from the nearest mainland. . . .

The islands, if we read their names along the curve north-west to south-east, are—Nihau, Kauai, Oahu, Molokai, Lauai, Maui, Kahulaui, Hawaii; the capital, Honolulu, is in Oahu, nearly midway in the curve. They were discovered in 1778 by the great navigator Captain Cook, who, on his return visit in the following year, met his death from the natives, through a miserable misunderstanding. As a rule, these natives are of the gentlest and sunniest disposition. They received Christianity in 1820 from some American missionaries, and the tale has often been told how a chieftainess, Kapiolani, one of their first converts, mounted the slope of Kilauea (supposed home of the terrible goddess Pelè), and broke the spell of the old bad religion, casting into the fiery lake a sprig of the scarlet-yellow ohelo berries, Pelè's sacred plant, and defied the goddess to hurt her. "If I perish by her anger, then dread her power. But see, I live and am safe, for Jehovah the Almighty is my God. O all ye people, behold how vain are the gods of Hawaii, and turn and serve the Lord!"

Unhappily, other white visitors came and brought evils to outweigh the good—drink, for instance, and terrible diseases; among these leprosy, now the scourge of the islands. It is not certainly known how the leprosy came to Hawaii some sixty years ago; but according to general belief, some ill-fated foreigner brought it over from Asia. Once introduced, it spread far and wide, helped by the sociability of the natives. They are hospitable to the last degree; all they have is yours. The sick and the sound would eat from the same dish, sleep on the same mat, even smoke from the same pipe. By 1865 leprosy had taken such a hold on the people that the Hawaiian Government determined to isolate the infected, and an Act was passed that all lepers should be deported to a settlement on the north coast of the island of Molokai.

Father Damien, when his ship dropped anchor in Honolulu harbour on March 19, 1864, if he knew of these poor lepers, probably thought little about them. His whole soul was bent on preaching the faith to the heathen. The bishop, Monseigneur Maigret, received him paternally; but before he could actually set out to evangelize the natives it was necessary that Damien, still in minor orders, should be ordained priest. Ordained he accordingly was, after two months' preparation, at Whitsuntide, and after visiting one or two of the islands in company with the bishop, was assigned to the district of Puna, among the volcanoes of Hawaii. . . .

"Truly," he writes to his brother Pamphile (now a parish priest at home), "I ought to be proud of my district, for it is as large as the whole diocese of Malines." With his superb bodily strength he accomplished wonders in traversing it. . . .

In a later letter occurs the entry:

> Leprosy is beginning to be very prevalent here. There are many men covered with it. It does not cause death at once, but it is very rarely cured. . . . Do not forget, my dear parents, to pray for me every day; there are so many dangers here both for one's soul and one's body.

We have seen that in 1865 the Hawaiian Government had passed a law to segregate the lepers in the island of Molokai. But to pass a law and to enforce it are two very different things. The lepers were scattered over the islands, and their friends and kinsfolk clung to them with truly Hawaiian tenderness. They hid them in their houses, and even deep in the woods. The law worked slowly for some years, though many men were taken to the leper island; but in 1873, under a new king, it began to be rigorously enforced. Then the ports of embarkation became constant scenes of the most tragic partings. Let Mr Clifford describe one, as he witnessed it some years later on his way to Molokai:

> The little steamer *Mokilii* leaves Honolulu, the capital of the islands, on Mondays at five o'clock for Molokai, and on the 17th of December I took my passage and went on board. The sunset was orange, with a great purple cloud fringed with gold. It faded quickly, and by the time we reached

> a small pier-head outside the town it was dark, and the moon was casting a long greenish light across the sea. From the pier came a continuous tremolo wail, rather mechanical, but broken by real sobs. I could see a little crowd of lepers and lepers' friends waiting there. "O my husband!" cried a poor woman again and again. Thirteen lepers got into the boat, and were rowed to the steamer. Then we sailed away, and gradually the wailing grew fainter and fainter, till we could hear it no longer.

Such scenes coming under Father Damien's close observation—for he had to comfort wives, husbands, fathers, mothers, who had lost their dearest—pierced him to the heart. His thoughts began to detach themselves from the spiritual welfare of his healthy parishioners, and to follow the poor lepers across the sea to Molokai, where was no priest nor shepherd of those souls that, more than any on earth, needed consolation.

A day came when he happened to attend the dedication of a chapel recently erected on the island of Maui. The bishop, Monseigneur Maigret, was there, and in his address lamented that, owing to the scarcity of missioners, he was unable to do anything for the poor lepers on Molokai, and especially did he regret that he was unable to send them a fixed pastor. Some young priests from the Picpus Congregation had just arrived for mission work, and before them Father Damien instantly spoke.

"Monseigneur," said he, "here are your new missioners. One of them could take my district; and if you will be kind enough to allow it, I will go to Molokai and labour for the poor lepers, whose wretched state of bodily and spiritual misfortune has often made my heart bleed within me."

Thus simply was made, by an obscure priest on a far-away island, an offer of which the heroism, when the world came to know it, made cowards shudder and brave men wish they had been braver. It was accepted; and that same day, without any farewells, Father Damien embarked with the bishop on a boat that was taking some fifty lepers to Molokai. On arriving, the bishop assembled the lepers and said: "My children, you have been left alone and uncared for. You shall be so no longer. Behold, I have brought you one who will be a father to you, and who loves you so much that for your sakes he does not hesitate to become one of you, to live and die with you." So the bishop departed, and Damien was left to his mission.

From the first he never doubted that he would take the leprosy in time; as how—constantly living with the contagion, dressing the patients' sores, washing their bodies, even digging their graves—could he escape it? But he fell to work with a cheerful heart. He was now about thirty-three years old, of unusual physical strength, hardened by much exercise and spare living. He had come in such haste that he had brought not even a change of linen. Since there was no house for him, and he could not herd with his lepers at night, for some while his only shelter at night was a pandanus-tree in the churchyard. There was no time to build a hut; for Molokai never saw the face of a doctor, and of his flock from eight to twelve were dying every week. In the midst of this first terrible business Father Damien found time to 'do things.' The lepers, though better lodged than he, were living pell-mell under booths constructed of rough timbers "covered with ki leaves or with sugar-cane leaves, the best ones with 'pili' grass. They passed their time with playing-cards, native dances, drinking fermented ki-root beer, home-made alcohol, and with the sequels of all this. Their clothes were far from being clean and decent, on account of the scarcity of water, which then had to be brought from a great distance. Many a time I have been compelled to run out of these domiciles to breathe fresh air. To counteract the stench I accustomed myself to the use of tobacco. The smell of the pipe preserved me somewhat from carrying in my clothes the noxious odour of the lepers." He sent word across to Honolulu, and by-and-by several schooner-loads of scantling arrived, to build decent frame-houses. Friends sent rough boards, shingles, flooring. Some of the lepers had a little money, and hired carpenters; for those without money Father Damien built with his own hands, helped by a little gang of leper boys. He sent requisitions across, and obtained warm clothing for his flock. He looked up at the cliff—the leper settlement lay under the shadow of a cliff—and wondered how to obtain a supply of water. Until now the lepers, when they wanted water, had to carry it from a distant gulch in pitchers on their sore shoulders; also they had to carry their filthy infected clothes to a considerable distance to wash them. Damien explored the stream, and, some way up its valley, came to a deep basin of ice-cold water. The natives informed him that in the severest droughts this basin never ran dry. He applied to Honolulu for water-pipes, which were sent, and with his lepers he piped a steady stream of clear water down to the settlement. He built chapels and a dispensary. Hitherto the lepers had dreaded the very name of hospital; and small wonder, for the same cart that brought a patient for admission brought his coffin also! Father Damien changed all this. He did not rest until the hospital was supplied with a resident doctor and nurses. He provided for the decent interment of the dead. Since the Government did not supply money to buy coffins (the price of a coffin was two dollars), those who died penniless were buried without them. Damien formed a "coffin association," and also made a large enclosed cemetery, adjoining one of his churches. Before 1879 he had buried sixteen hundred lepers, and often had to act as undertaker and sexton as well as priest. "I dig the graves," he wrote home, "and if time allows I make the coffins." He set himself a far harder task—to fight the despairing vice that had taken for its motto, "In this place there is no law." He found this vice to be fed by a drink which the lepers distilled from the root of a plant called 'ki.' The law forbade this distillation, and in enforcing the law Damien learned what it means to be hated for righteousness' sake. He earned unpopularity. His enemies were obstinate, his supporters were indolent; nor did the tide turn until both discovered that he, their best friend, had become a leper even as they.

He had lived with them about ten years when he began to suspect it. He quietly consulted the doctors who came over to Molokai, and they reassured him. But one day, feeling unwell, he took a foot-bath. The water brought him was scalding, but he plunged his feet in it and did not discover that it was overhot until he saw the effects of the scald. Then too well he knew. This deadness of feeling is one of the first symptoms. "I have seen," writes Father Albert, a missioner who laboured at Molokai for some years, "the lepers sometimes take a knife and chop off their dead fingers and toss them away, just as if they were pieces of wood." Damien asked the resident doctor to examine him carefully. "I cannot bear to tell you," said Dr Arnim, "but what you say is true." "It is no shock to me," said Damien, "for I have long felt sure of it."

In his letters home he made no mention of his fate, but to his bishop he wrote:

> I cannot come to Honolulu, for leprosy has attacked me. There are signs of it on my left cheek and ear, and my eyebrows are beginning to fall; I shall soon be quite disfigured. . . . The good God knows what is best for my sanctification, and I say gaily, "Fiat voluntas tua,"[1] with a ready heart.

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[1] Thy will be done.

Henceforward, in preaching to his flock, he no longer said "My brethren," but "We lepers." By this time the tale of his self-devotion had travelled among many nations of men; but their wonder and pity could not help him. "He saved others; himself he could not save." He went steadily forward to the end, instructing his fellow-outcasts, receiving their confessions, binding their sores, even feeding them, putting the food into their mouths when the leprosy had eaten away their hands—all the while facing the sight of that to which he must surely come. Mr Clifford thus describes a meeting with him in these latter days, and his appearance:

> At dawn we were opposite Kalaupapa. Two little spired churches caught my eye first, and around them were dotted the white cottages of the lepers, who crowded the pier to meet us. But the sea was too rough for us to land. . . . We went on to Kalawoo, but were again disappointed; it was too dangerous to disembark. Finally it was decided to put off a boat for a rocky point about a mile and a half distant from the town. Climbing down this point, we saw about twenty lepers, and "There is Father Damien!" said our purser; and slowly moving along the hillside I saw a dark figure with a large straw hat. He came rather painfully down, and sat near the waterside, and we exchanged greetings across the waves. . . . At last all was ready, and we went swinging across the waves, and finally chose a fit moment for leaping on shore. Father Damien caught me by the hand, and a hearty welcome shone from his kindly face as he helped me up the rock. He immediately called me by my name, "Edward." . . . He is now forty-nine years old—a thick-set, strongly built man, with black curly hair and short beard, turning grey. His countenance must have been handsome, with a full, well-curved mouth and a short, straight nose; but he is now a good deal disfigured by leprosy, though not so badly as to make it anything but a pleasure to look at his bright, sensible face. His forehead is swollen and rigid,

> the eyebrows are gone, the nose is somewhat sunk, and the ears are greatly enlarged. His hands and face look uneven with a sort of incipient boils, and his body also shows many signs of the disease, but he assured me that he felt little or no pain.

Towards the end his noble spirit at times came near to breaking down. Reports of his disease found their way into the Belgian newspapers. Some one imprudently told the news to his old mother, and it hastened her death (1886). In 1887 he writes home:

> My dear brother, having been informed that some of the Belgian papers had stated the death of your exiled brother, I suppose that is one reason why you do not write to me any more. Unfortunately, Almighty God has not yet called me out of this miserable world.

That is the one and only querulous passage to be discovered in all his correspondence; and the letter promptly goes on: "I have accepted this malady as my special cross, which I try to carry, as Simon the Cyrenian, in the footsteps of our Divine Master." In a letter to Mr Clifford (February 21, 1889) he repeats this image: "My love and good wishes. . . . I try to make slowly my way of the cross, and hope to be soon on the top of my Golgotha."

On Thursday, the 28th of March, ne took to his bed, having first arranged his temporal affairs. "How happy I am," he said, "to have given all to Monseigneur! Now I die poor, having nothing of my own." On the 30th he made his general confession to Father Wendelin, who ministered to him. "Look at my hands," he said. "All the wounds are healing, and the crust is becoming black; that is a sign of death, as you know very well. Look at my eyes. I have seen so many lepers die that I cannot be mistaken. Death is not far off. I should have liked to see the bishop again; but the good God is calling me to keep Easter with Himself."

"My father," said Wendelin, "will you leave me your mantle, that I may inherit your great heart?"

"Fie! What would you do with it?" said Damien. "It is full of leprosy."

He also said, after receiving extreme unction: "How good God is to have preserved me long enough to have two priests by my side at my last moments, and also to know that the good Sisters of Charity are at the *léproserie.* This has been my *Nunc Dimittis.* The work of the lepers is assured. I am no longer necessary, and so will go up yonder."

"When you are there, father," said Wendelin, "you won't forget those whom you are leaving orphans?"

"Oh, no," he answered; "if I have any credit with God, I will intercede for all who are in the *léproserie.*"

After this he rallied a little, but on April 13th became much worse, and on the 15th died without a struggle, as if falling asleep. Towards the end he had a vision of two figures continually standing watch—one at his bed's head, the other at his feet. Who they were he did not say.

In accordance with his own wish, his friends buried him beneath the pandanus-tree whose boughs had been his roof when he first came to Molokai. He had lived in Molokai a little over sixteen years.

A. T. QUILLER-COUCH, *The Roll Call of Honour*

THE LONE DOCTOR

One of the most remarkable men of the present century is Albert Schweitzer, born in Alsace-Lorraine in 1875. He had already achieved great distinction as an organist and as professor of philosophy and theology, when the sight of a statue helped to alter the whole course of his life. The statue was that of Admiral Bruat, at Colmar: at the base of it was the figure of a negro. That sculptured figure brought home to Schweitzer the terrible evils which the white races had thrust upon their coloured brethren, and he vowed to spend his life helping to atone for these evils by devoting himself to the service of black people.

For this purpose he took up the study of medicine, specializing in tropical diseases. His wife, in the meantime, prepared to share in his self-appointed task by qualifying as a nurse.

Then, in 1913, collecting what funds he could, he set out for French Equatorial Africa, where he knew there was an overwhelming need for doctors.

The exact spot for which they were destined was Lambarene, on the river Ogowe, just a little south of the equator. There were already a few whites living in the neighbouring lowlands—officials, a few missionaries, storekeepers, and timber-traders. The natives themselves had been reduced to a mere handful of their normal numbers during the three hundred years since the coming of the white man and the two great evils that he had brought with him—alcohol and the slave trade; most of the latter traffic connected with America. Almost all the white man's diseases had followed in his train, so that it seemed, indeed, as if the only civilization that the natives knew had brought them not blessings but curses. Schweitzer was right when he said, "Anything we give them is not benevolence but atonement."

Before the new doctor had been there three weeks he had had a taste of pretty well all the drawbacks that doctoring in darkest Africa had to offer.

The first drawback was the very people whom he had come to help. Sometimes they were amusing, more often pathetic, most often annoying. His first experience of native psychology was provided by the negro who had been engaged as interpreter and doctor's assistant, and without whom nothing could be done. Intimation of the Doctor's arrival had been sent to him—but he never turned up. Urgent messages were dispatched—he replied with apologies and contrite promises. He was engaged on a 'lawsuit,' he explained, but just a day or so and he would be with the Doctor. The weeks passed—still he didn't turn up. Providence at that stage sent along a sensible native who had been a cook and who was a good linguist: and who was, needless to say, immediately hired. When Joseph, for such was his name, had been working happily for some months the original applicant appeared!

The second great drawback was the labour question—a very vital point indeed when the first job to be tackled must be the erection of a hospital. But out there in the wilds, where home-keeping Europeans imagine that the white man has only to stretch out his hand with a few pence to have swarms of black men rushing for the privilege of working for him, Schweitzer found that there were no labourers to be had for building. The few available were working in the timber trade for wages with which the little medical mission, with its small resources, could not compete. This was Schweitzer's first experience of the fact that, as he wrote later, "Labourers are nowhere more difficult to find than among primitive races, and nowhere are they paid so well in proportion to the work they do in return."

What was to be done? There was only one thing. In one of the corners of the sitting-room in the Doctor's bungalow stood the farewell gift to him of the Paris Bach Society—a grand piano, which had been hauled up to Lambarene along the river in a canoe made from a gigantic tree-trunk and capable of carrying three tons. In the opposite corner he had a space cleared, where he rigged up shelves for drugs and instruments. This was his dispensary. The 'hospital' would have to be the clearing outside in the scrub—for the first rule to be observed in Africa, for one's own sake, is, "Never have a sick native inside the house when it can be avoided, for fear of infection."

Before long the drawbacks of this latter arrangement made it quite clear that it could not be other than a temporary one. Firstly, there was the terrible fatigue of treating patients under the burning sun. Secondly, there was the frequency of sudden storms, which meant that everything—patient, bandages, drugs, and instruments—had to be picked up in a moment and carried out of the torrential downpour into the shelter of the veranda.

A roof of some sort was absolutely necessary; so the Doctor, in default of a better place, established his operating theatre in an old fowl-house in the grounds. The walls, thick with dirt, had to be washed down and thickly white-washed, and the roof was so riddled with holes that the Doctor had to wear his sun-helmet as protection, for a single ray, filtering through an aperture the size of a florin, has been known to send a man delirious.

But it was, at any rate, a beginning, and soon a regular method of working was established. Consultation hours began at 8.30 A.M., preceded by the reading in two dialects of six 'commandments' of the Doctor, headed by: "Spitting near the house is forbidden." Each patient on leaving was given a piece of cardboard with his number on it, so that the Doctor, or Oganga, as he quickly became known, could look up the case at any time in his register.

But what the patients were ordered to do and what they actually did were very different things. Although they regarded medicine with awe and reverence, its proper uses they were almost entirely unacquainted with and seemingly unable to learn, no matter how carefully, how laboriously the instructions were impressed upon them. The Doctor, from bitter experience, came to expect the worst, and knew that generally they rubbed themselves over with the powders, ate the ointment, and swallowed a whole week's medicine at a gulp.

Another problem, which soon became very trying, was to find an efficient means of storing drugs. Owing to the danger of deterioration or destruction, all medicines had to be not only kept but handed out in tins or bottles—receptacles whose value the Doctor declares that he had never fully appreciated till he worked in the damp heat of the equator, and of which even now he vows the hospital will never have enough.

After a few months of operating in the fowl-house the Doctor decided that the time had come to take steps about his promised hospital. Urgent representations to the Paris Evangelical Mission brought him eighty pounds. He thereupon borrowed eight labourers from a timber-merchant to level the site decided upon, using a spade himself with the best of them. After certain delays the hospital was completed—a corrugated-iron shed of four rooms, with cement floors, large windows, with netting over them, and a roof with a white calico lining, to stop mosquitoes from getting through. Side by side with this went up large huts, made from unhewn logs and raffia-leaves, for waiting-rooms, and a long dormitory for housing the patients.

This dormitory must have been the queerest hospital ward ever erected. On its floor of beaten earth sixteen large rectangles were marked out with a stick. To each patient was allotted one rectangle, on which his friends or relatives must proceed to erect a bed for him—a primitive but practical type, made out of four short posts forked at the ends, with two strong side poles tied on to them with creeper stalks. The mattress was of cross-stakes covered with dried grass. Underneath the mattress were stored the patient's boxes, cooking utensils, and bananas—staple item of diet.

In these rude surroundings the Doctor performed the most intricate operations, and was brought into contact with strange diseases that many European medical men would have given their ears to investigate.

The natives had knowledge of slow and subtle drugs and poisons which had the most amazing effects. There were certain juices which enabled men to row hard for a whole day without experiencing hunger, thirst, or fatigue. There were drugs which made men into maniacs, and against which the strongest antidotes had no effect. Schweitzer continually met traces of such drugs and poisons, but never managed to track down their secrets, for to have disclosed them to a white man would have brought death on the betrayer. "The medicine-men never forgive," Schweitzer was told one day by his servant Joseph, "and they live among us without any one knowing who they are."

Thus the natives walked in terror of their lives, and their lives were steeped in terror. By night and by day it haunted them—terror of witchcraft, of evil spells, of fetishes; so that Schweitzer, overcome with horror at the grip these torturing superstitions had on their lives, exclaimed, "In this matter the greatest sceptic, did he find himself out here, would prove a real helper of mission work."

For the most part, however, the diseases which he had to fight were more familiar and easier to deal with. There was, before all, the sleeping-sickness carried by the dreaded tsetse. There were acute heart-disease, leprosy, chills, rheumatism, chronic nicotine poisoning, pneumonia, toothache, strangulated hernia, besides the more ordinary malaria and the sunstroke which sometimes befell white patients who came his way.

Unlike the natives in many parts of French Equatorial Africa, where blood is 'unclean,' and who therefore refuse to be touched with the knife, the Doctor's patients quarrelled as to who should be first operated on. The first patient who rebelled was a small boy of the cannibal Pahouin tribe, who, only too familiar with the uses of the knife, and imagining that he was being taken in to the Doctor to be killed and eaten, had to be carried in by sheer force.

Many more detailed descriptions than there is space to repeat here will be found in the Doctor's own vivid story of his work, entitled *On the Edge of the Primeval Forest.* In this book the Doctor discusses with sanity and without bias the hundred and one problems other than medical with which the white man among primitive peoples is confronted, and to which he must find a solution according to his own conscience. Government questions such as forced labour, the problem of the educated native, of the native Christian, relations between the whites and the blacks, special mission problems such as polygamy and wife-purchase, and relations between missions of different denominations—he has something worth saying about them all, something that has been worked out by a mind of great sanity and kindliness, with broad views and common sense, and, what is most important, the mind of a man of no preconceived prejudices against one side or another. He speaks always as he has found, and it is interesting to observe that, although he never puts blinkers on or refuses to recognize evil when he meets it, there are few human creatures known to him, in high places or humble, about whom he has not discovered something good to say.

In the first nine months that the Doctor was out in Lambarene he treated over two thousand patients. His work continued—a constant struggle against climate, poor equipment, lack of medicines, overwork (for Mme Schweitzer and Joseph were his only assistants)—and consequent strain. No job, whatever it might be—digging, planting, building—ever seemed to be properly executed unless the Doctor or his wife were there to take charge, and often, when the Doctor himself was concerned in it, to take spade or hammer and impatiently to set an example.

It needed superhuman self-control to keep going in such conditions, and how many times the Doctor has sunk dumbly into a chair, ill with discouragement and despair at what has seemed the hopelessness and the thanklessness of his task, he alone knows. The people whom he was trying to help—at what sacrifice we know—were their own worst enemies. Their ignorance was the least of their faults. They lied; they thieved; they were lazy, appallingly unreliable, hopelessly dishonourable; they were, seemingly, irredeemable. But Schweitzer reminded himself that he was there primarily to help them, and by so doing, not to shoulder a little of the 'white man's burden,' but to pay off a little of 'the white man's debt.' Almost all of them were sufferers, almost all undeservedly. They bore 'the mark of pain,' as the Oganga termed it, and to him its appeal has never failed to wipe out all anger, its disappearance to bring sufficient recompense for all he has renounced. . . .

[In 1914, when war broke out, Schweitzer was interned by the French. As Alsace was then in German hands he was nominally a German; and the great services he had performed were overlooked. On his release at the end of the war he returned to Lambarene with five helpers.]

All set out with high hopes. Devastation met their eyes. Constant attack is the only method of keeping the jungle at bay. During the years of retreat from the station it had crept over the once carefully tended clearing and claimed it as its own. The grass was once more jungle; seedlings had shot up into young trees; thick creepers, as strong as rope, had everything in their grip; and, half buried in this desolation, lay the once cherished buildings, half collapsed, rotten with damp, ant-eaten. There was a famine, as they had half expected; there was a plague of dysentery raging and spreading—there was sufficient to break the hearts and spirits of all of them.

After months and months of struggle against these conditions, of clearing and re-erecting as quickly as possible bamboo huts with raffia roofing, the Doctor came to the conclusion that the odds against him were not only too great, but unnecessary. In a letter home he wrote: "I can no longer struggle against the realities of the situation. Fresh foodstuffs continually rise in price, and rice is already prohibitive. . . . I have therefore decided to take on a plot for a plantation three kilometres up the river."

This change of quarters meant more clearing of virgin ground, more fighting the jungle, more building—with not a single able-bodied labourer available. All the men were in the forests working for the timber trade, felling trees, rolling them to the water's edge, making them into rafts, and floating them to Port Gentil.

The Doctor, accustomed to making the best of seemingly hopeless situations, turned to the only material he had—his patients. Every one who was capable of any physical effort had to turn to and help. Even those who could not walk could pull out weeds, seated on the ground! Imagine it!

The Doctor himself supervised the clearance work and the building, while the medical side was handled by the other members of the staff, for the job took all his thought and his time.

The cost of every nail had to be considered, and the ex-professor of philosophy would sometimes lie in bed making calculations till far into the night. Materials had to be transported all the way from Europe, because it was cheaper than carting them from the interior of the forest. Carpenters were as rare as diamonds—and more precious, even when they couldn't read measurements. But neighbours helped—one lent one thing and another lent another—and the Doctor continued to act as foreman, with spade, pen, hammer, and carpenter's rule in hand in turn, until at last the new hospital was ready for the sick and there only remained to be built the housing accommodation for the medical staff themselves.

At last everything was ready—but only just in time to allow the household gear and cases of medical stores to be shipped from down the river, for the dry season was beginning and the sandbanks were already protruding out of the water.

The new hospital—corrugated-iron buildings erected on piles so that they would not be carried away in the floods—was got into full swing without delay, the medical staff all working as hard and as long as circumstances and the climate would permit. There was Schweitzer at the head, with a Swiss doctor and an Alsatian one, three nurses, and three British helpers, including a Scottish woman doctor, to help him.

They had—and have—many odd jobs to do, this staff, which a conventional medical man in Europe would consider very queer. One of the nurses has to supervise household affairs; another has to keep an eye on the people who are feeding and planting. For Schweitzer's dream embraces a sort of Garden of Eden, so fruitful that 'stealing' may be made lawful. Before that can be realized there are great forests to be cleared away, thick with creepers so heavy that they smother all fruitful growth and keep away all light and air. There are paths to be made and, as the forest retreats, oil palms to be cultivated, bananas, maize, manioc, orange, lemon, grapefruit, guava, and other tropical fruit-trees.

Not so romantic but just as useful are the improvements that have already been carried out in Lambarene: a cement reservoir, for holding a supply of pure rain-water; a leopard-proof sty, for the local pigs; a cement pool, for the ducklings; and a proper store for such commodities as manioc, rice, bananas, palm oil, and dried fish. The Swiss Family Robinson ideal has been attained, even if the Garden of Eden hasn't.

The world crisis has reached even Lambarene, however, and that the mission has labourers available to carry out the necessary tasks is due to the fact that the important timber trade is suffering, with many consequent economic repercussions. The patients have often not even the smallest 'offerings' to bring in return for medical service. Even Europeans have to be treated for weeks for nothing. Unemployed whites drift to the hospital for refuge; they have nowhere else to lay their heads. "We can only hope," says the Doctor, "that some of them will later on be able to repay the expense we have been put to on their behalf."

Schweitzer periodically makes a flying visit to Europe, to collect more funds for his work. Since the day when he deliberately seemed to turn his back on all honours, to plunge into obscurity, honours have showered upon him. Universities on the Continent and in England and in Scotland have bestowed on him coveted honorary degrees; great men have asked to talk with him; cities have clamoured for his music, churches and abbeys for his words, and reports on their organs. The Goethe Prize for distinguished service to humanity was awarded him by the city of Frankfurt. And there is no nation that would not be proud to call him son.

(A-K-18)

But he goes back to Africa. He will always go back as long as there is work there for him to do—work there which he can do.

MARJORIE HESSELL TILTMAN, *God's Adventurers*

THE FIGHT AGAINST HYDROPHOBIA

The modern science of Bacteriology—the study of germs and microbes—is largely due to the researches of Louis Pasteur, one of the greatest scientists of all time. Through discoveries originated by Pasteur, doctors have been able to save hundreds of thousands of lives. Among the many diseases, in animals and men, with which his name will always be associated as a healer are pébrine (a disease which threatened to destroy the silkworm industry in France), anthrax in sheep and cattle, and above all, hydrophobia.

This last-named, also known as rabies, had been a scourge of mankind for hundreds of years, and was one of the most dreaded of all diseases. By means of patient research Pasteur discovered that the disease was caused by a microbe, and that a vaccine could be prepared which would immunize the victim. His experiments were for a long time confined to animals. He proved to his satisfaction that dogs can be made immune to rabies either before or after being bitten by mad dogs. But for a long time he hesitated to vaccinate human beings, lest he should cause the very disease he was seeking to cure. He considered, indeed, trying the effect on himself, and in March 1885 wrote to a friend: "I have a good mind to begin on myself, that is to say, to inoculate myself with rabies and then to arrest the consequences; for I am beginning to feel very sure of my results."

But the need for this did not arise. A natural victim of a mad dog presented himself a few months later, and had the distinction of being the first patient to benefit by Pasteur's great discovery. The story of his treatment, and that of subsequent patients, has been splendidly told by Pasteur's son-in-law, René Vallery-Radot, in his life of the great scientist—a book which is one of the classics of scientific literature.

On Monday, July 6, Pasteur saw a little Alsatian boy, Joseph Meister, enter his laboratory, accompanied by his mother. He was only nine years old, and had been bitten two days before by a mad dog at Meissengott, near Schlestadt (Sélestat).

The child, going alone to school by a little by-road, had been attacked by a furious dog and thrown to the ground. Too small to defend himself, he had only thought of covering his face with his hands. A bricklayer, seeing the scene from a distance, arrived, and succeeded in beating the dog off with an iron bar; he picked up the boy, covered with blood and saliva. The dog went back to his master, Théodore Vone, a grocer at Meissengott, whom he bit on the arm. Vone seized a gun and shot the animal, whose stomach was found to be full of hay, straw, pieces of wood, etc. When little Meister's parents heard all these details they went, full of anxiety, to consult Dr Weber, at Villé, that same evening. After cauterizing the wounds with carbolic, Dr Weber advised Mme Meister to start for Paris, where she could relate the facts to one who was not a physician, but who would be the best judge of what could be done in such a serious case. Théodore Vone, anxious on his own and on the child's account, decided to come also.

Pasteur reassured him; his clothes had wiped off the dog's saliva, and his shirt-sleeve was intact. He might safely go back to Alsace, and he promptly did so.

Pasteur's emotion was great at the sight of the fourteen wounds of the little boy, who suffered so much that he could hardly walk. What should he do for this child? Could he risk the preventive treatment which had been constantly successful on his dogs? Pasteur was divided between his hopes and his scruples, painful in their acuteness. Before deciding on a course of action, he made arrangements for the comfort of this poor woman and her child, alone in Paris, and gave them an appointment for five o'clock, after the Institute meeting. He did not wish to attempt anything without having seen Vulpian[1] and talked it over with him. . . . Vulpian expressed the opinion that Pasteur's experiments on dogs were sufficiently conclusive to authorize him to foresee the same success in human pathology. . . . Was there any other efficacious treatment against hydrophobia? If at least the cauterizations had been made with a red-hot iron! But what was the good of carbolic acid twelve hours after the accident? If the almost certain danger which threatened the boy were weighed against the chances of snatching him from death, Pasteur would see that it was more than a right, that it was a duty to apply antirabic inoculation to little Meister. . . .

Vulpian and M. Grancher[2] examined little Meister in the evening, and, seeing the number of bites, some of which, on one hand especially, were very deep, they decided on performing the first inoculation immediately; the substance chosen was fourteen days old and had quite lost its virulence: it was to be followed by further inoculations gradually increasing in strength.

It was a very slight operation, a mere injection into the side (by means of a Pravaz syringe) of a few drops of a liquid prepared with some fragments of medulla oblongata.[3] The child, who cried very much before the operation, soon dried his tears when he found the slight prick was all that he had to undergo.

Pasteur had had a bedroom comfortably arranged for the mother and child in the old Rollin College, and the little boy was very happy amidst the various animals—chickens, rabbits, white mice, guinea-pigs, etc.; he begged and easily obtained of Pasteur the life of several of the youngest of them.

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[1] A physiologist interested in Pasteur's work.

[2] A physician who assisted Pasteur in his laboratory.

[3] The lowermost part of the brain. In this case the brain of a rabbit purposely infected with rabies was used.

"All is going well," Pasteur wrote to his son-in-law on July 11:

> the child sleeps well, has a good appetite, and the inoculated matter is absorbed into the system from one day to another without leaving a trace. It is true that I have not yet come to the test inoculations, which will take place on Tuesday, Wednesday, and Thursday. If the lad keeps well during the three following weeks, I think the experiment will be safe to succeed. I shall send the child and his mother back to Meissengott, in any case, on August 1, giving these good people detailed instructions as to the observations they are to record for me. I shall make no statement before the end of the vacation.

But as the inoculations were becoming more virulent, Pasteur became a prey to anxiety: "My dear children," wrote Mme Pasteur, "your father has had another bad night; he is dreading the last inoculations on the child. And yet there can be no drawing back now! The boy continues in perfect health."

Renewed hopes were expressed in the following letter from Pasteur:

> MY DEAR RENÉ,
>
> I think great things are coming to pass. Joseph Meister has just left the laboratory. The three last inoculations have left some pink marks under the skin, gradually widening and not at all tender. There is some action, which is becoming more intense as we approach the final inoculation, which will take place on Thursday, July 16. The lad is very well this morning, and has slept well, though slightly restless; he has a good appetite and no feverishness. He had a slight hysterical attack yesterday.

The letter ended with an affectionate invitation: "Perhaps one of the great medical facts of the century is going to take place ; you would regret not having seen it !"

Pasteur was going through a succession of hopes, fears, anguish, and an ardent yearning to snatch little Meister from death ; he could no longer work. At nights feverish visions came to him of this child whom he had seen playing in the garden, suffocating in the mad struggles of hydrophobia, like the dying child he had seen at the Hôpital Trousseau in 1880. Vainly his experimental genius assured him that the virus of that most terrible of diseases was about to be vanquished, that humanity was about to be delivered from this dread horror—his human tenderness was stronger than all, his accustomed ready sympathy for the sufferings and anxieties of others was for the nonce centred in "the dear lad."

The treatment lasted ten days ; Meister was inoculated twelve times. The virulence of the medulla used was tested by trephinings[1] on rabbits, and proved to be gradually stronger. Pasteur even inoculated on July 16, at 11 A.M., some medulla only one day old, bound to give hydrophobia to rabbits after only seven days' incubation ; it was the surest test of the immunity and preservation due to the treatment.

Cured from his wounds, delighted with all he saw, gaily running about as if he had been in his own Alsatian farm, little Meister, whose blue eyes now showed neither fear nor shyness, merrily received the last inoculation ; in the evening, after claiming a kiss from "Dear Monsieur Pasteur," as he called him, he went to bed and slept peacefully. Pasteur spent a terrible night of insomnia ; in those slow dark hours of night when all vision is distorted, Pasteur, losing sight of the accumulation of experiments which guaranteed his success, imagined that the little boy would die.

The treatment being now completed, Pasteur left little Meister to the care of Dr Grancher (the lad was not to return to Alsace until July 27) and consented to take a few days' rest. He spent them with his daughter in a quiet, almost deserted country place in Burgundy, but without, however, finding much restfulness in the beautiful, peaceful scenery; he lived in constant expectation of Dr Grancher's daily telegram or letter containing news of Joseph Meister.

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[1] Operations on the skull.

By the time he went to the Jura, Pasteur's fears had almost disappeared. He wrote from Arbois to his son on August 3, 1885: "Very good news last night of the bitten lad. I am looking forward with great hopes to the time when I can draw a conclusion. It will be thirty-one days to-morrow since he was bitten."

On August 20, six weeks before the new elections of Deputies, Léon Say, Pasteur's colleague at the Académie Française, wrote to him that many Beauce husbandmen were anxious to put his name down on the list of candidates, as a recognition of the services rendered by science. . . .

"Your proposal," Pasteur replied,

> touches me very much. . . . But politics frighten me and I have already refused a candidature in the Jura and a seat in the Senate in the course of this year.
>
> I might be tempted perhaps, if I no longer felt active enough for my laboratory work. But I still feel equal to further researches, and on my return to Paris, I shall be organizing a 'service' against rabies which will absorb all my energies. I now possess a very perfect method of prophylaxis against that terrible disease, a method equally adapted to human beings and to dogs. . . . Before my departure for Jura I dared to treat a poor little nine-year-old lad whose mother brought him to me from Alsace, where he had been attacked on the 4th ult., and bitten on the thighs, legs, and hand in such a manner that hydrophobia would have been inevitable. He remains in perfect health.

On his return to Paris, Pasteur found himself obliged to hasten the organization of a 'service' for the preventive treatment of hydrophobia after a bite. The Mayor of Villers-Farlay, in the Jura, wrote to him that, on October 14, a shepherd had been cruelly bitten by a rabid dog.

Six little shepherd boys were watching over their sheep in a meadow; suddenly they saw a large dog passing along the road, with hanging, foaming jaws.

"A mad dog!" they exclaimed. The dog, seeing the children, left the road and charged them; they ran away shrieking, but the eldest of them, J. B. Jupille, fourteen years of age, bravely turned back in order to protect the flight of his comrades. Armed with his whip, he confronted the infuriated animal, who flew at him and seized his left hand. Jupille, wrestling with the dog, succeeded in kneeling on him and forcing its jaws open in order to disengage his left hand; in so doing, his right hand was seriously bitten in its turn; finally, having been able to get hold of the animal by the neck, Jupille called to his little brother to pick up his whip, which had fallen during the struggle, and securely fastened the dog's jaws with the lash. He then took his wooden *sabot*, with which he battered the dog's head, after which, in order to be sure that it could do no further harm, he dragged the body down to a little stream in the meadow, and held the head under water for several minutes. Death being now certain, and all danger removed from his comrades, Jupille returned to Villers-Farlay.

While the boy's wounds were being bandaged, the dog's carcase was fetched, and a necropsy took place the next day. The two veterinary surgeons who examined the body had not the slightest hesitation in declaring that the dog was rabid.

The Mayor of Villers-Farlay, who had been to see Pasteur during the summer, wrote to tell him that this lad would die a victim of his own courage unless the new treatment intervened. The answer came immediately: Pasteur declared that, after five years' study, he had succeeded in making dogs refractory to rabies, even six or eight days after being bitten, but he had only once applied his method to a human being, but that once with success, in the case of little Meister; and that, if Jupille's family consented, the boy might be sent to him. "I shall keep him near me in a room of my laboratory; he will be watched and need not go to bed; he will merely receive a daily prick, not more painful than a pin-prick."

The family, on hearing this letter, came to an immediate decision; but, between the day when he was bitten and Jupille's arrival in Paris, six whole days had elapsed, whilst in Meister's case there had only been two and a half!

Yet, however great were Pasteur's fears for the life of this tall lad, who seemed quite surprised when congratulated on his courageous conduct, they were not what they had been in the first instance—he felt much greater confidence.

A few days later, on October 26, Pasteur in a statement at the Academy of Sciences described the treatment followed for Meister. Three months and three days had passed, and the child remained perfectly well. Then he spoke of his new attempt. Vulpian rose:

"The Academy will not be surprised," he said, "if, as a member of the Medical and Surgical Section, I ask to be allowed to express the feelings of admiration inspired in me by M. Pasteur's statement. I feel certain that those feelings will be shared by the whole of the medical profession.

"Hydrophobia, that dread disease against which all therapeutic measures had hitherto failed, has at last found a remedy. M. Pasteur, who has been preceded by no one in this path, has been led by a series of investigations unceasingly carried on for several years, to create a method of treatment, by which the development of hydrophobia can *infallibly* be prevented in a patient recently bitten by a rabid dog. I say infallibly, because, after what I have seen in M. Pasteur's laboratory, I do not doubt the constant success of this treatment when it is put into full practice a few days only after a rabic bite.

"It is now necessary to see about organizing an institution for the treatment of hydrophobia by M. Pasteur's method. Every person bitten by a rabid dog must be given the opportunity of benefiting by this great discovery, which will seal the fame of our illustrious colleague and bring glory to our whole country."

Pasteur had ended his reading by a touching description of Jupille's action, leaving the Assembly greatly impressed by the conduct of that boy of fourteen, sacrificing himself to save his companions. An Academician, Baron Larrey, whose authority was rendered all the greater by his calmness, dignity, and moderation, rose to speak. After acknowledging the importance of Pasteur's discovery, Larrey continued: "The sudden inspiration, agility, and courage with which the ferocious dog was muzzled, and thus made incapable of committing further injury to bystanders . . . such an act of bravery deserves to be rewarded. I therefore have the honour of begging the Académie des Sciences to recommend to the Académie Française this young shepherd, who, by giving such a generous example of courage and devotion, has well deserved a Montyon prize."

Bouley, then chairman of the Academy, rose to speak in his turn:

"We are entitled to say that the date of the present meeting will remain for ever memorable in the history of medicine, and glorious for French science; for it is that of one of the greatest steps ever accomplished in the medical order of things—a progress realized by the discovery of an efficacious means of preventive treatment for a disease, the incurable nature of which was a legacy handed down by one century to another. From this day, humanity is armed with a means of fighting the fatal disease of hydrophobia and of preventing its onset. It is to M. Pasteur that we owe this, and we could not feel too much admiration or too much gratitude for the efforts on his part which have led to such a magnificent result."

RENÉ VALLERY-RADOT, *The Life of Pasteur*
(translated by Mrs R. L. Devonshire)

THE FATHER OF MODERN SURGERY

IT is somewhat startling to realize that as little as seventy years ago a patient who had entered a surgical hospital might consider himself quite lucky if he lived to come out. Further back still in time, a wounded man was probably fortunate if he escaped the attentions of the surgeon altogether. A gunshot wound might be painful or even fatal, but not so painful nor so likely to be fatal as the surgeon's remedy.

In the sixteenth century the view was held that gunshot wounds were poisoned, and to cure the poison boiling oil of elder and treacle was often poured into the wound. One of the best surgeons of the period, Ambroise Paré, records that one day he ran short of his boiling oil and treacle before he had dressed the wounds of all his patients. He had therefore to apply to his last group of patients a milder dressing. He was afraid that he would find this batch of patients dead next morning, poisoned by their wounds. When he visited them he was quite surprised to discover that they had had a good night's rest and that their wounds were healing satisfactorily; whereas those patients dressed with the usual scalding oil were feverish, in great pain, and were suffering from wounds which were now badly inflamed.

We may smile at Paré's innocent surprise at what seems to us quite obvious. But much of the progress in medical knowledge has had to be made by the difficult and painful method of trial and error.

Sometimes it has taken very many years for an advance to be made; and this was so with surgery. Until comparatively recent years surgical method had progressed very slowly indeed. In the early part of last century an Edinburgh surgeon, Dr Bell, notes that abdominal wounds were almost inevitably fatal. "There is no reason," he says, "why we should take any note of a man having died after such a wound." If the patient survived, then the matter was really worth recording! Yet to-day abdominal operations are among the most common of those carried out in surgical hospitals.

Even later in the same century the records of surgical hospitals were deplorable, judged by modern standards. During the 1850's and 1860's anything from 40 to 60 per cent. deaths in amputation cases was considered unsensational. A surgeon of this epoch has noted with satisfaction that a mortality of 25 to 30 per cent. was considerably lower than that of most metropolitan hospitals in England. In Paris the figure was twice as high. The records of military hospitals show that the percentage of deaths after amputation had reached the appalling figure of 75 to 90. In the Franco-Prussian war of 1870-71 hip-joint amputation resulted in death in every case. Sir James Simpson, a famous surgeon of the day, asserted that "the man laid on the operating-table in one of our surgical hospitals is exposed to more chances of death than was the English soldier on the field of Waterloo."

To-day, not only have these figures been enormously reduced, but operations that before were scarcely ever attempted, so inevitably did they lead to death, are now carried out as a matter of course, and with a very low mortality.

How has this startling change come about? The answer can be given in two words: Joseph Lister.

Lister, who came of a Quaker family, began medical practice in 1854, when surgery was in the sad state that we have just noted. From the earliest days of his career he was profoundly interested in wounds. In due course he went to Edinburgh, and at the age of thirty-three became surgeon at the Glasgow Infirmary.

He had by this time had ample opportunity for studying the conditions that prevailed in hospitals, and he did not like what he found. The high mortality disturbed him, though at first he found it hard to reduce the figures.

It must have been highly distressing to him to realize that a good many of the too numerous deaths were directly due to the hospitals themselves. The supposed house of healing was too often a house of death. Operations conducted in private houses were actually more likely to prove successful than hospital operations—a terrible reflection. The trouble was that an operation was very frequently followed by one of the chief septic diseases, pyæmia, erysipelas, and hospital gangrene. Epidemics of these were regarded as inevitable in hospitals. Death after death occurred through them; and the surgeons could only shrug their shoulders and consider themselves, and their patients, as being unlucky—not because they were callous, but because they just did not know what to do about it.

Yet not only were the surgeons accepting the passage of these dread visitors through the wards, but they themselves, had they known it, were doing their best to encourage the terror they would have liked to banish. It was customary for a surgeon to perform his operations in an old discarded coat, too dirty to be of service for anything else. In the course of time the coat would acquire an outer layer of filth and blood of which the owner was often quite proud, for it indicated the amount of work he had been doing. Such coats must have offered splendid accommodation to the germs responsible for sepsis.

Conditions, moreover, were ideal for passing on septic diseases from a patient who suffered from them to one who did not. Highly infected patients lay side by side in the wards with their uninfected comrades; and nurses and dressers passed freely from one to the other. A surgeon might even be called straight from a post-mortem examination to assist at an operation. There might or might not be a jug or two of water, a basin, and a few towels for the use of the staff. That was considered sufficient for cleansing hands and instruments: there was no attempt at proper sterilization.

The hospital authorities were none the less baffled when one epidemic of erysipelas or gangrene followed another. The only answer that they could see to the problem was that the building had become so impregnated with disease that the best way out of the trouble was to put the pick to the infected fabric. But this was not a solution which appealed to hospital authorities, though some surgeons who had studied hospital diseases strongly advocated it. The authorities' reluctance was natural. It is never easy to raise enough money to carry on the expensive task of running a hospital. If the whole building had to be demolished every few years the expenses would be overwhelming.

Fortunately a better solution was near at hand.

It was in 1865 that Lister made the discovery which not only altered the whole course of hospital surgery, and eventually checked hospital epidemics, but which, it has been said, made it possible for modern surgery to exist.

Sensational though its results were, his discovery was not in itself sensational. It consisted primarily in the realization that sepsis was due to microbes conveyed to the wound by contact of some kind. This microbe theory was indirectly inspired by Pasteur's discoveries, but it was Lister alone who saw its significance in the matter of hospital diseases. Thus does the work of one great man help forward that of another.

Working on Pasteur's theory that diseases could be caused by germs or microbes, Lister sought to discover whether such germs caused the septic diseases of wounds. If this were so, Lister concluded, then these diseases might be prevented if the wound and everything that came into contact with it, including the air, were to be so treated that all germs were destroyed.

This was the root principle of his famous system of antiseptic surgery. He tested it out; and his conviction that he had reached the essential truth grew stronger.

It took many years for Lister to decide on the best method of applying his theory. After a great deal of experiment he chose carbolic acid as the most satisfactory medium for destroying the germs in the wound and in the air about it, without doing too much injury to the wound itself, or hindering the natural process of healing. To start with he tried flushing the wounds with undiluted acid, but this proved needlessly harmful to the body-tissues. Eventually a solution of one in twenty or one in forty was found quite effective as a germ-killer and less damaging to the wound. He also tried mixing the acid with oil and carbonate of lime, forming a putty-like substance suitable as an antiseptic dressing.

In 1867 Lister made known his discoveries. In a paper read at a Dublin meeting of the British Medical Association he described the remarkable results which his antiseptic methods had achieved at Glasgow Infirmary:

> Since the antiseptic treatment has been brought into full operation, and wounds and abscesses no longer poison the atmosphere with putrid exhalations, my wards, though in other respects under precisely the same circumstances as before, have completely changed their character; so that during the last nine months not a single instance of pyæmia, hospital gangrene, or erysipelas has occurred in them.

One might expect that a discovery so valuable and far-reaching in its effects would have been welcomed with enthusiasm by Lister's contemporaries. But such was not the case. His antiseptic theories were treated with disapproval and scorn, even abuse, by many surgeons of the day. Doctors tend to be sceptical of new ideas, perhaps because innovations and experiments must be made with caution, for their subject-matter is human life. For this reason most medical reforms have had to fight against violent opposition before they could obtain recognition. Though the ward almost adjacent to Lister's at Glasgow Infirmary had been full of pyæmia and gangrene during the period when Lister's ward was completely free from either, surgeons were reluctant to believe that the cause of this freedom was the new antiseptic method of treating wounds. Among Lister's opponents, it is regrettable to record, was Sir James Simpson, who had himself, a few decades previously, had to fight down the opposition to the discovery of anæsthetics by which he had placed humanity so much in his debt.

Lister, however, received some recognition in Scotland, and was appointed to replace a famous Professor of Surgery at Edinburgh. In a few years he had gathered round him a band of students earnestly devoted to his beliefs.

Then came one of his hardest and most splendid decisions. He was offered a Professorship of Surgery at King's College Hospital, London. It was not an inviting prospect to exchange his enthusiastic following at Edinburgh for the unfriendly atmosphere of a London hospital : London had been more reluctant than any other town to accept his methods. But Lister felt that the conversion of the London hospitals might be effected if he accepted the post. So he turned his back on friendly Edinburgh, and came to the half-empty wards and grudgingly offered patients of the hospital in Denmark Hill.

An example of the opposition his methods called forth is well shown in one of his early cases there. He opened up the joint of a fractured knee-cap in order to join the fractured pieces together, first of all duly taking his antiseptic precautions. Hitherto such an operation had inevitably been followed by sepsis of the joint, often resulting in death. A well-known London surgeon stated that when the patient died proceedings ought to be taken against Lister for malpractice. This drastic suggestion, however, was never put into effect. Instead of dying the patient made an exceptionally quick recovery!

In the course of time Lister succeeded in winning over the greater part of English surgical opinion to his methods, or a development of them, not only by his remarkable results but also by his kindly, sincere, and modest manner. In many countries abroad his beliefs had already been widely accepted, and impressive results had followed the adoption of his methods. A German surgeon, Richard von Volkmann, was considering closing his hospital at Halle, so numerous were the deaths from pyæmia and erysipelas after any serious operation. After reading Lister's account of his methods Volkmann decided to try them out as a forlorn hope. The death rate in his amputation cases immediately fell from 61 per cent. to 5 per cent. In the next year or so he performed sixty amputations without losing a single patient. Henceforth Lister had no more doughty champion on the Continent than Richard von Volkmann.

A similar story came from Munich, where one of Germany's largest and most unhealthy hospitals existed. Hospital gangrene affected as many as 80 per cent. of all wounds, and (as in the case of the Halle hospital) the closing of the building was being seriously considered. Nussbaum, the chief surgeon, had tried everything he could think of to combat the horror of hospital disease. Nothing had succeeded.

At last (in 1875) he introduced Lister's newest methods, scrupulously observing all his instructions. In a single week he achieved results that staggered him. "Everything went well," he writes;

> not a single case of hospital gangrene occurred. Pyæmia and erysipelas were observed a few times at the very beginning; but only, as the result proved, because we did not yet possess the necessary practice in the carrying out of Lister's directions. . . . Our results became better and better, the time of healing shorter, and pyæmia and erysipelas completely disappeared.

Lister, as we have already seen, was a great enough man to be always ready to modify his own theories. He was never afraid to learn from experience. As his experience grew, so his antiseptic methods underwent considerable change. The presence of germs in the air—a danger which he had originally attempted to counter by a rather cumbersome apparatus which sprayed the air throughout an operation—was found to be unimportant. Sepsis was the result of germs introduced directly by some infected object, which, in the case of a hospital operation, might be the patient's own skin, the hands or breath of a doctor or nurse, or the instruments, sponges, or other appliances that were used. In his later years, therefore, Lister gave up the spray and concentrated on protecting the wound from direct infection.

(It is pleasant to be able to record that Lister, unlike so many pioneers, lived to see his labours honoured and rewarded. He was created Baronet in 1883, became President of the Royal Society in 1895, and was the first medical man ever to be raised to the peerage. He was also one of the first distinguished men to receive the high honour of the Order of Merit, instituted by King Edward VII in 1902.

But more than these and the many other honours showered upon him, here and abroad, he valued the esteem of his fellow-workers in the cause of science, and the realization that his efforts to bring relief to humanity had achieved success, and would be continued by those following in his steps.)

No finer tribute has been paid to any man than that paid to Lister by the American Ambassador at a meeting of the Royal Society in 1902: "It is not a Profession, it is not a Nation, it is Humanity itself which, with uncovered head, salutes you."

G. F. L.

THE CONQUEST OF MALARIA

The history of science is a record of attempts made by devoted men and women to wrest from nature secrets which enable us to save life or to develop life more fully day by day. If the seeker after truth succeeds in adding something to the sum total of human knowledge, then sooner or later his work is recognized. If he fails, his work remains unknown to the world, and others carry on the search.

Often the margin that divides success from failure is as narrow as a knife-edge. A few minutes of extra work when the body is already tired beyond endurance and the brain cries, "It is useless," may result in a discovery that will save countless human lives. Sometimes the discovery comes like a flash of lightning; more often it is the reward of infinite patience, of sheer dogged persistence which takes no thought of time or difficulties or sacrifices.

To patience of that order the world owes the greatest medical discovery of the past fifty years—the discovery that malaria, dread scourge of the tropics, is 'carried' by mosquitoes. It is apparently simple, yet it has revolutionized the whole study of tropical medicine and made inhabitable vast tracts of the earth's surface where formerly men died or were incapacitated in their tens of thousands. None knew how this terrible disease was spread until the secret was revealed by two British doctors, who will always be honoured as benefactors of the human race.

To solve the problem we have referred to, Sir Ronald Ross toiled for years in India, being encouraged by Sir Patrick Manson at home. A dozen times he nearly abandoned hope of finding the evidence that he sought. His eyesight nearly failed under the strain. He became so weary that when he found his first clue he did not realize that he was on the verge of success after years of failure.

The story of how this remarkable man, whose services to humanity have even now not received just recompense from those enriched by his work, finally detected the means by which the germs of malaria are spread is one of the most romantic in the whole history of scientific research. Had he failed, millions now living in Asia, Africa, and America would be dead.

Of all tropical diseases the most common is malarial fever. It causes roughly one-third of all the attendances at hospitals in the tropics, and about one-third of the entire population in many hot countries suffer from it every year. Although only about one case in several hundreds proves fatal, yet the disease is so prevalent that the total number of deaths due to it is colossal. It has been officially estimated that in India alone something like 1,300,000 deaths are caused by it in an average year. It has affected Europe as far north as Holland and England. In Greece and around Rome the disease was until recently a curse. Over a vast part of the earth's surface malaria remains a plague which threatens at every turn all who live within the region affected.

For years scientists and doctors sought the secret of how it was spread. Some declared it to be caused by the night air, others that it came from infected water. Both theories were to be disproved.

In demonstrating to the world how malaria was spread, and thus how it could be fought, Manson and Ross defeated the tiny flying insect which until the beginning of the twentieth century was the most dreaded enemy of the British Empire—an enemy before which Army, Navy, and doctors were powerless.

Sir Patrick Manson was a Scottish doctor, born near Aberdeen, who in 1866 went out to become medical officer at

Read by [illegible]

a Chinese hospital in Formosa. There he studied elephantiasis, the strange disease which causes legs and arms, or other parts of the body, to assume monstrous proportions. And there he was first brought into contact with malaria at close quarters.

A theory then generally held was that elephantiasis, a tropical disease like malaria, was caused by the night air of marshes. Manson began his investigations, and came to the conclusion that the presence in human blood of a parasite called the filaria worm probably had some connexion with the disease. But the discovery only raised a greater problem. How did the filaria worm get into the blood? The worm could neither walk nor fly. A possibility was that it was sucked up by something that fed upon human blood, then released again into the bodies of previously uninfected persons.

The evidence pointed to the mosquito, which in biting a person infected with the germs of elephantiasis and then passing on to uninfected persons might well spread the disease. To test this theory, Manson examined the blood of some of his native helpers at the hospital. Finding one who was heavily infected, he induced him to sleep in a room containing mosquitoes and to let them bite him.

The next morning Manson collected the insects, gorged with the blood of the infected boy. He dissected them and examined them under a microscope. They were all infected with live filaria worms. Thus was it discovered that the mosquito was the carrier of the germ which caused elephantiasis.

Manson's discovery set certain men thinking. If the mosquito carried the parasite of one disease from person to person, might it not also spread malaria? A French doctor named Laveran, working in Algeria, definitely suggested that the mosquito might spread malaria. But the medical world in general was in no hurry to give up its theories on the subject. Manson retired from practice in China and came to live in England.

Nothing further was done for some years.

Then in 1894 Major Ronald Ross, of the Indian Medical Service, a doctor who had long been interested in the study of malaria and other tropical diseases, returned home on leave, and while in London called upon Manson. The hour for the final onslaught had struck. Manson explained his theories to Ross, who resolved, upon his return to India, to begin at once the experiments which have led to such triumphant results.

Thus began one of the most famous partnerships in the history of research, a partnership between two devoted servants of humanity, one in London and the other in India, who laboured for four years, inspiring and encouraging each other when doubts assailed them.

Back in India, Major Ronald Ross set to work in earnest. He contrived that mosquitoes should suck up blood full of the parasites of malaria. If mosquitoes were actually the carriers of the disease, then the parasites would be found, alive, within their bodies. But although he dissected hundreds of insects, Ross could not find what he was seeking. Actually, he was then trying to infect the wrong type of mosquito, for only one variety, and only the female of that variety, is able to suck up and develop the germs.

Month after month Ross toiled away. Experiment succeeded experiment without success.

Manson still believed that it would be found that human beings contracted malaria from mosquitoes through drinking water infected by the insects after they had sucked up blood containing the germs. Ross disproved this, and found the real solution, but not until he had wasted valuable time in testing Manson's original theory.

In his *Memoirs* Sir Ronald Ross relates how he tried to establish the truth or otherwise of the infected-water theory by taking four mosquitoes which had fed upon a malarial victim and placing them in two bottles with a little water. The bottles were kept in a cool place for a week, at the end of which the mosquitoes were dead. In addition to the bodies of the infected mosquitoes, the bottles contained grubs, showing that the eggs laid by the insects had been hatched.

Now Ross made his test. After removing the bodies of the mosquitoes, but not the grubs, he gave the contents of the bottles to certain natives who volunteered, after a full explanation of the experiment had been made to them, to drink the water. "I think myself justified in making this experiment," wrote Ross, "because of the vast importance a positive result would have, and because I have a specific in quinine always at hand."

The result of the experiment was odd. One man developed an illness which at first seemed like malaria, but when his blood was examined no malarial parasites were found. Two other men who drank the infected water remained quite well.

Further experiments with infected water yielded negative results. In fact, that first case of intermittent fever, which was a coincidence, was the only case in which any after-effects followed the drinking of water exposed to infected insects.

Eventually Ross abandoned Manson's theory, so far as the means of infection was concerned, and began to search for other means by which the parasites within the mosquito might enter the blood of human beings—the search which was to end in his brilliant discovery.

After many months the strain of the work in a torrid climate began to tell upon Ross. He writes of this period in his *Memoirs* (Murray, London, 1923):

> At first I toiled comfortably, but as failure followed failure I became exasperated and worked until I could hardly see my way home late in the afternoons. Well do I

> remember that dark, hot little office in the hospital at Begumpett, with the necessary gleam of light coming in from under the eaves of the veranda. The screws of my microscope were rusted with sweat from my forehead and hands, and its last remaining eye-piece was cracked.

By now he had begun to suspect that the mosquito he sought was a type which eluded him. One morning a 'mosquito-man,' one of the three who collected the insects for him, produced some larvæ which hatched into brown mosquitoes with three black bars on their wings. These proved to be dappled-winged mosquitoes of a type which Ross had not worked with before.

They were allowed to bite a malarial patient in the hospital, and later some were dissected. Again no germs of malaria were found. That was on August 16, 1897, in Secunderabad. Ross secured more specimens of the dappled-winged brown mosquito during the next few days.

Thus the story comes to August 20, 1897, the anniversary of which Sir Ronald Ross called Mosquito Day. The first few mosquitoes placed under the microscope revealed nothing. Then Ross came to one of the last of the batch which had been allowed to feed upon the malarial patient on the 16th. His eyes were already feeling the strain, but carefully, methodically, he searched through the tissues of that tiny winged creature. Again nothing. At last only the stomach of the insect remained to be examined. That meant half an hour's work, and already he was tired out. Moreover, he had examined the stomachs of thousands of mosquitoes without finding any trace of the germ.

Tired as he was, he began to work again, but a kindly fate must have watched over Ross that day. What followed may best be told in his own words:

> I had scarcely commenced the search again when I saw a clear and almost perfectly circular outline before me of

> about twelve microns in diameter. The outline was much too sharp, the cell too small, to be an ordinary stomach-cell of a mosquito. I looked a little further. Here was another and another exactly similar cell. I now focused the lens carefully on one of these, and found that it contained granules of some black substances, exactly like the pigment of the parasites of malaria. I counted altogether twelve of these cells in the insect, but was so tired out with the work and had so often been disappointed before that I did not at the moment recognize the value of the observation. After mounting the preparation, I went home and slept for nearly an hour. On waking, my first thought was that the problem was solved, and so it was.

Ross had discovered that the germs of malaria were sucked by certain mosquitoes from the body of an infected human being, and developed in the stomach-tissue of the insect. He had made one of the greatest medical discoveries, saved millions of lives, and yet he did not appreciate what it all meant until he had slept! That incident reveals how utterly weary he was, in mind and body, at the end of months of failure.

The next day Ross dissected the last survivor of the same batch of mosquitoes. Within its stomach he found similar cells—only larger! That was conclusive. The cells were parasites, and they not only lived but grew within the mosquito. The discovery was really two discoveries, and each was of vital importance. As Ross wrote afterwards:

> We had to discover two unknown quantities simultaneously—the kind of mosquito which carries the parasite, and the form and position of the parasite within it. By an extremely lucky observation I had now discovered both the unknown quantities at the same moment. The mosquito was the *Anopheles*, and the parasite lives in or on its gastric wall and can be recognized at once by the characteristic pigment. All the work on the subject which has been

done since then by me and others during the last thirty years has been mere child's play which anyone could do after the clue was once obtained.

In his great joy at the prospects opened up by the discovery Ross composed these verses to commemorate the day:

This day relenting God
Hath placed within my hand
A wondrous thing; and God
Be praised. At His command,

Seeking His secret deeds
With tears and toiling breath,
I find thy cunning seeds,
O million-murdering Death!

I know this little thing
A myriad men will save.
O Death, where is thy sting?
Thy victory, O Grave? . . .

There were many ready to scoff. Even after Ross had infected birds by exposing them to malaria-carrying mosquitoes, there were many who declared that he and others had "mosquitoes on the brain."

Happily Ross was content to pursue his investigations to the end, undeterred by criticism and unspoiled by praise. He believed he was on the right road. That was enough. To him is the glory of a great victory over death and disease.

Ross's discovery brought him honours, but not wealth. Like many others who have devoted their lives to research, Ross remained a poor man. For his work he was awarded, in 1902, one of the greatest distinctions of its kind in the world—the Nobel Prize for Medicine. There exists in Putney an Institute of Tropical Diseases named after him, and of which he was Director-in-Chief until his death in September 1932. . . .

When Ross went to India as a young man he found every one, even the most brilliant doctors, struggling in vain with a disease which attacked millions every year. They could mitigate its attacks with quinine, but they could not prevent them, and they did not even know where to look for the enemy. In the course of four years Ross discovered the enemy, and showed how it could be conquered.

Those yet unborn, wrestling with other secrets of life and death, will know moments when the struggle seems hopeless. In those moments perhaps they will remember the story of Sir Ronald Ross, and find in it their inspiration.

T. C. Bridges and H. Hessell Tiltman,
Master Minds of Modern Science

HEROES OF HAVANA

A YEAR or two after the discovery of the malarial parasite in the body of the *Anopheles* mosquito, a little band of American doctors in Havana was investigating the possibility that yellow fever—sometimes known as "Yellow Jack"—might also be spread by mosquitoes. This terrible disease had for years been a scourge in South and Central America; and the vast project of the Panama Canal, begun by the French in 1880, was wrecked by the wholesale slaughter caused by the activities of this frail insect. The French gave up the enterprise for good, with a loss of over £50,000,000 and nearly 20,000 lives; eventually it was the Americans who took over the work. Not until the region was completely cleared of mosquitoes, however, could the cutting of the canal be restarted, and it was the knowledge gained in Havana that enabled this clearing to be attempted.

The routing of "Yellow Jack" remains one of the greatest and most heroic feats in the history of medical science.

TWELVE years after the Panama Canal was abandoned by the French the Americans were fighting the Spaniards in Cuba, and yellow fever was raging in the American ranks. Havana, the capital of the island, was a hotbed of infection. Hundreds of men went down with it. The hospitals were full of them. Doctors did all they knew, but they were helpless. "Yellow Jack" laid its finger on the men and tortured the lives out of them.

Then Dr Sternberg, the Surgeon-General of the United States Army, took action. Appointing four army doctors, James Carroll, Jesse W. Lazear, Walter Reed, and Aristides Agramonte, who were then in Havana, he instructed them to try to discover the cause of the disease. They lost no time. In June 1900 they straightway began to experiment to see if the disease was caused by fomites, and soon satisfied themselves that yellow fever was not contracted directly from either patients or articles soiled by them.

They now determined to work on the mosquito theory, to see if it held good in the case of yellow fever as well as in elephantiasis and malaria. Knowing that human beings were necessary for the tests they desired to make, this little band of heroes decided that they would first of all experiment upon themselves. They had witnessed the horrors of yellow fever so often that they knew they were risking their lives. Nor did they flinch. They were prepared to make the supreme sacrifice for science.

Agramonte was immune from the disease and at the last moment Reed was recalled to America, but Carroll and Lazear made ready to go through with their programme. Lazear bred some mosquitoes, and infected them by allowing them to bite patients who were suffering from yellow fever. On July 27, 1900, Dr Carroll submitted to the ordeal of being bitten. The insects alighted on him and fed, and in a short time he became terribly ill. His colleagues fought desperately for his life, and although for three days his condition was very grave he managed in the end to pull through.

Any doubts that remained were settled in the most heroic manner by Dr Lazear. He was in the hospital taking samples of blood from stricken patients for experimental purposes, when a mosquito hummed round his head and alighted on his hand. He did not disturb it. Calmly he watched it feed, and made a note of all its movements. His one desire was to solve the mystery of "Yellow Jack."

In five days he was down with a raging attack of yellow fever. Often he was delirious, but he was perfectly conscious when the deadliest symptoms of all supervened. He knew then that he was doomed. Carroll was just recovering from his own grave attack, and for a moment the two men gazed at each other. "I shall never forget the alarm in his eyes," said Carroll.

Two days later Lazear was dead.

No truer words were ever written than those engraved on the tablet to his memory: "With more courage than the devotion of a soldier, he risked and lost his life to show how a fearful pestilence is communicated, and how its ravages may be prevented."

The Government of the United States showed its recognition of his heroic services by granting his wife and two children a paltry allowance of £1 a week. Anything more niggardly is impossible to conceive. Eight years later the force of public opinion made the authorities deal more justly toward his widow, and the pension was increased to a little more than £6 a week.

Lazear gave his life to prove that mosquitoes caused the disease of yellow fever, but there were still many aspects of the problem to be solved. It was nearly twenty years previously that Finlay[1] had allowed infected stegomyia mosquitoes to bite healthy people. How and why did those people escape? Several other people had also recently been bitten by infected mosquitoes. What was it that enabled them to evade any evil consequences, while Lazear was murdered by the mosquito and Carroll nearly lost his life?

Reed and Carroll both had a suspicion that a certain time must elapse after the mosquito had bitten one yellow fever patient before it could transmit the disease to another human being, an 'incubation period' during which the parasites of the disease developed. But they were not certain. The tests pointed to it, just as they indicated that the mosquito alone was the cause of yellow fever. But everybody thought the disease was spread in other ways, and only further tests could clear up the matter.

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[1] A doctor in Havana who had failed in his attempts to prove that yellow fever was carried by mosquito-bites.

Dr Reed set out to make these tests, and to show that mosquitoes alone were responsible for transmitting the disease. He called for volunteers, and offered a reward of £40 for every man who was willing to be bitten. Dr Lazear's dreadful death was the talk of Havana, but it did not deter volunteers from coming forward. The first two were John Kissinger and John Moran.

Dr Reed pointed out the great risk, and mentioned the reward.

"We did not offer ourselves for the sake of the money," they said quickly. "We will only consent provided we are not paid for it. We offer ourselves solely for the cause of humanity and in the interest of science."

The doctor was profoundly moved. "Gentlemen, I salute you," he said. He was their superior officer, they were simple privates, but the doctor saw before him only two very gallant gentlemen as he came smartly to the salute.

Kissinger was the first to go through the tests. Three times he underwent the ordeal of resting quietly on a bed while the infected mosquitoes bit him. On the third occasion five mosquitoes bit him and he had a severe attack of fever, from which he subsequently recovered.

On the day that Kissinger was bitten by the five mosquitoes, the scene was set for Moran's ordeal. "At noon on the same day," wrote Dr Reed,

> five minutes after the mosquitoes had been placed therein, a plucky Ohio boy, Moran by name, clad only in his night-shirt and fresh from a bath, entered the room containing the mosquitoes, where he lay down for a period of thirty minutes. Within two minutes of Moran's entrance he was being bitten about the face and hands by the insects, which had promptly settled upon him. Seven in all bit him at

> this visit. At 4.30 P.M. the same day he again entered and remained twenty minutes, during which time five others bit him. The following day, at 4.30 P.M. he again entered and remained fifteen minutes, during which time three insects bit him; making the number fifteen that had fed at these three visits. On Christmas morning at 11, this brave lad was stricken with yellow fever, and had a sharp attack which he bore without a murmur.

Moran too recovered, and the world will endorse Dr Reed's tribute to the two heroes: "In my judgment this exhibition of moral courage has never been surpassed in the annals of the Army of the United States."

As a result of his ordeal, Kissinger later on became permanently paralysed, and the country he had served so well awarded him 15*s*. a week. Following an agitation, this was later increased to £6 a week by Congress, but the American exchequer, in the same parsimonious spirit that had characterized it throughout, cut it down to £5 a week before passing the grant.

Other tests carried out on other men proved conclusively that the mosquito actually transmitted the disease, and a final experiment to prove that yellow fever was not contagious, like smallpox, was carried out by Dr R. Cooke and two other volunteers.

A special hut was prepared for them, carefully screened to keep out mosquitoes, and here the foul bedding and clothing of patients who had died of yellow fever were collected. With the utmost heroism the three men calmly entered the hut, donned the awful night-clothes of the victims, drew the soiled sheets over them, and went to sleep. Nobody knew but that they were going to their death. Each man was all too familiar with the risk, yet each went into the hut night after night and breathed in the foul air until daylight. It was a remarkable exhibition of cool courage. For three weeks they underwent their ordeal for the sake of humanity, and when, after a further period, not one of the heroes contracted yellow fever, it was definitely proved that the mosquito alone carried and spread the disease, and the way for building the Panama Canal was plainly indicated. . . .

On the last day of the old year, he [Reed] wrote:

> Only ten minutes of the old century remain. Here have I been sitting reading that most wonderful book, *La Roche on Yellow Fever*, written in 1853. Forty-seven years later it has been permitted to me and my assistants to lift the impenetrable veil that has surrounded the causation of this most wonderful, dreadful pest of humanity and to put it on a rational and scientific basis. I thank God that this has been accomplished during the latter days of the old century. May its cure be wrought out in the early days of the new! The prayer that has been mine for twenty years, that I might be permitted in some way or in some time to alleviate human suffering, has been granted. . . .

Dr Reed worked night and day to unravel the mystery of yellow fever, trying to arouse the medical world to the danger of the mosquito. The doctors of Havana believed, but those elsewhere turned a deaf ear. For nearly twenty years Finlay had been condemning mosquitoes, and the doctors who got into touch with him thought he had an obsession on this particular point.

Instead of Reed meeting the recognition he deserved, he came up against the deadly medical inertia, and his health was much affected by the crass stupidity and folly that he saw around him. Worn out and disappointed, he had an attack of appendicitis in November 1902. He seemed to realize that the end was nigh, but his thoughts were not of himself or his sufferings: his mind was troubled about his loved ones. Just before he went under the anæsthetic to be operated on he turned to an old medical friend: "I am not afraid of the knife," he said. "But if anything happened to me, I am leaving my wife and daughter so little."

He died on November 22, 1902, and the American Government awarded his widow the same pension as that awarded to Lazear's dependents. Five years later Dr Carroll passed away: thus the little band of heroes did not long survive their discovery.

DAVID MASTERS, *The Conquest of Disease*

THE BLIND ROAD-MAKER

A GREAT change in the condition of roads came about as a result of the mechanical inventions that speeded up the textile industries. Trade increased to such an extent, with a consequent increase in the requirements for greater transport facilities, that the government was compelled to develop better means of communication.

Up to this time there had been few engineers of eminence, and none who had paid any attention to road-making, which was regarded as a task beneath the dignity of an engineer. As late as 1768 it was considered remarkable that the engineer Smeaton should condescend to make a road across the valley of the Trent between Markham and Newark. The usual method of repairing the roads was roughly to spread stones from the nearest quarry, instead of breaking them up to a uniform size and laying them carefully on the road. The stones were not formed into a surface, but were left to be crushed into position by the wheels of passing carts and wagons.

It is thus not so extraordinary as might otherwise appear that the first maker of really satisfactory roads was a blind man. This man stands out, however, as a great figure, who contributed very materially to the establishment of the system of transport that was to be the basis of England's industrial greatness.

John Metcalf, born in 1717 at Knaresborough in Yorkshire, was the son of poor working people. He was not born blind, but a severe attack of smallpox when he was six years old resulted in the loss of his sight. When he was sufficiently recovered to be able to go out again he began to find his way about by groping from door to door along the walls on either side of his home. In about six months he could find his way to the end of the street without a guide, and three years later he was able to go on errands to any part of the town.

Metcalf was an exceptionally strong and healthy boy, and, as his confidence in finding his way about increased, he naturally became eager to associate in the games and sports of boys of his own age. He joined his companions in bird-nesting expeditions and soon became an expert climber. In addition he spent many happy hours in roaming about the fields and lanes until he came to know every foot of the ground for miles around Knaresborough. In the evenings he learned to play the violin, becoming so proficient that he was offered engagements to play at country dances; and subsequently he secured regular engagements at Harrogate and Ripon.

Metcalf grew to be 6 feet 2 inches in height, and he was a man of fine physique. He saved sufficient money to buy a horse and became an expert rider. A great affection grew between horse and man, and riding became one of his greatest pleasures. He travelled about alone in a remarkable fashion, and many stories are told of the extraordinary manner in which he overcame the handicap of blindness. He visited London twice, and on the second occasion he was entertained by Colonel Liddell, of Ravensworth Castle. When the time came for Metcalf to return the Colonel offered him a seat on his coach, but the offer was declined, Metcalf calmly saying that he could walk as far in a day as the Colonel was likely to travel in his coach. It seems almost incredible that a blind man should suppose he could walk 200 miles over a strange road in the same time that a coach could perform the journey, yet Metcalf actually arrived at Harrogate before the Colonel. The explanation of the slowness of the coach lies in the really terrible state of the roads, which made travelling on foot the fastest mode of progression. (There is a story of a man with a wooden leg who was offered a lift on a stage-coach, an offer that he declined on the ground that he was in a hurry!)

During the rebellion that broke out in 1745 Metcalf did a considerable amount of fighting, and became well known as "Blind Jack." After the battle of Culloden he returned home to take up the more peaceful pursuit of a general carrier between York and Knaresborough. It was about the year 1765, while engaged in this occupation, that he became interested in a scheme to construct a turnpike road between Harrogate and Boroughbridge. The necessary Act of Parliament authorizing the making of this road had been passed, but in such a remote country district the surveyor found it difficult to discover a man who was capable of carrying out the work. During his wanderings about the country Metcalf had thought a good deal about the universally bad state of the roads. He was shrewd enough to foresee that a new and promising line of business would be opened up if the Harrogate and Boroughbridge road could be constructed successfully, for probably it would be the first of many similar highways. He therefore approached the surveyor with an offer to construct three miles of the proposed road, between Minskip and Fearnsby. Such was the surveyor's confidence in the blind man's ability that he gave him the contract immediately.

Having sold his stage-wagons and his interest in the carrying business, Metcalf tackled his new undertaking with the greatest vigour. The material for constructing the whole length of the road was to be procured from one gravel-pit, and Metcalf made elaborate arrangements for hauling out the ballast and distributing it to the road gangs with speed and economy. The work proceeded rapidly and without a hitch, the contract was completed to the entire satisfaction of the surveyor, and Metcalf's reputation became enhanced.

Shortly afterwards tenders were invited for the building of a bridge at Boroughbridge, and Metcalf sent in a tender that was accepted. This task was entirely new to him, but he completed it satisfactorily within the contract time. Subsequently he constructed numerous roads and bridges with great success. His roads lasted well, and after times of heavy flood he was able to point with pride to his bridges, all of which were standing, while many constructed by other builders had collapsed.

When a road from Huddersfield to Manchester was decided upon Metcalf contracted to make it at so much a rood, before the line of the road had been marked out. Subsequently, to his dismay, he found that the surveyor's route involved crossing some deep marshy ground on Pule and Standish Commons. He pointed out to the trustees that he would be involved in much greater expense by following the surveyor's line, but the trustees assured him that, if he succeeded in completing the road to their satisfaction, he would not be a loser. In the opinion of the surveyor it was necessary to dig out the bog until a solid foundation was reached, but Metcalf realized that not only would this be a slow and costly proceeding, but in the end the road would be unsatisfactory. He pointed this out to the trustees, but they refused to allow the road to pass round the marshy land. Metcalf was thus placed in a difficult position. Finally, after much thought, he solved the problem by persuading the trustees to allow him to make the road across the marshes in his own manner on condition that, if it proved unsatisfactory, he would reconstruct it at his own expense on the surveyor's plan.

The contract stipulated that nine miles of the road must be completed within ten months, and Metcalf, having gained his point, lost no time in commencing the preliminary operations. Soon he had nearly four hundred men engaged on the work at six different points. The main difficulty lay in rendering the road practicable for heavy vehicles, and in order to make this possible Metcalf ordered great quantities of heather to be pulled and bound up into small bundles of a size that conveniently could be grasped with the hand. These bundles were placed close together in rows in the direction of the line of the road, and afterwards similar bundles were laid down transversely upon them, the whole being well pressed down. Stones and gravel were then spread over the bundles, and a firm and level road was produced. The work had been watched with keen interest by a crowd of spectators, who had assembled in full expectation of seeing both horses and wagons disappear in the bog. These expectations were not realized, however, and when the first wagon to cross reached firm ground in safety it was greeted with loud cheers. The whole length across the marshes was completed in the same manner, and this section proved one of the best and driest parts of the whole road. Metcalf's method of building this road across the marshes was the same as that subsequently adopted by Stephenson in carrying the Liverpool and Manchester Railway across Chat Moss.

Metcalf continued road-making for over thirty years. His last road was between Haslingden and Accrington, with a branch road to Bury, which proved to be one of the most difficult works he had undertaken. He completed this road in 1792 at the age of seventy-five, and afterwards retired to Spofforth, near Wetherby, where he spent his remaining years on a small farm.

He died peacefully in 1810 in his ninety-third year, leaving behind him a wonderful record of triumph over one of the most terrible of all physical disabilities.

ELLISON HAWKS, *The Romance of Transport*

THE BIRTH OF THE AEROPLANE

THE story of Wilbur and Orville Wright's determined struggle to solve the problems of heavier-than-air flight is a story of splendid endeavour rewarded by splendid success. Theirs was certainly one of the greatest attainments of this or any preceding age; a triumph that was gained by the exercise of those qualities of brain and heart that in the material sphere have raised mankind to the predominating position it occupies on this planet. Properly understood and appreciated, it is a story that should kindle the imagination to as fine an elation as any tale of heroic exploits of remoter days. The fullness of the triumph does not belong to the Wrights alone; it is shared by all those adventurers who through hundreds of years had sought to bring the regions of the air within the ambit of man's activity, and may be shared by any who have the ambition to enlarge the fields of this conquest. But the long romance of endeavour culminated in the work of the Wrights, and theirs was the decisive victory. Moreover, the combinaton of qualities which the brothers brought to bear upon their task included all those that throughout had made progress possible and were essential for ultimate success. . . .

Wilbur Wright, the third son of Milton Wright, was born near Newcastle, Indiana, U.S.A., in 1867, and Orville was born in 1871 at Dayton, Ohio, where the Wrights were then living. They were of New England stock, one of their ancestors having emigrated from England as early as 1637. While still a boy Orville possessed himself of a primitive printing outfit and began to publish a boys' paper. Later, with an improved press he produced a weekly newspaper, *The West Side News*. Wilbur then joined him in the capacity of editor, and soon they were publishing a weekly magazine in addition, which they called *Snap Shots*. Wilbur, who had a crisp and telling literary style, contributed numerous articles on local affairs. These were the great days of the 'safety bicycle,' and the brothers, apt and business-like as they always were, started the Wright Cycle Company, manufacturing a machine known as the 'Van Cleve,' which won a local reputation for soundness and good workmanship. They were thus engaged when their attention was first directed to aeronautics.

It was in 1896 that a newspaper paragraph recording the death of Otto Lilienthal[1] in Germany, and giving a brief account of his exploits, roused their interest in flying. It is a pleasant thought that Lilienthal, who in his life had done so much for the cause of flight, should by his death have inspired with something of his own ardour the two young men who were destined to take up the work to which his life had been devoted, and bring it to fulfilment. The incident of Lilienthal's death seems to have made a deep impression upon Wilbur, and he was moved to re-read one of his favourite books, Marey's *Animal Mechanism*. "From this I was led," he later declared in a lecture, "to read more modern works, and as my brother soon became equally interested with myself, we soon passed from the reading to the thinking, and finally to the working stage."

They read all the existing aeronautical literature that they could lay hold upon; the writings that most encouraged them were those of Lilienthal and Langley, and from them they were soon able to estimate the stage of progress that aeronautical science and practice had reached. They were also influenced by the work of Stringfellow, whose designs they regarded as valuable contributions to the development of the aeroplane.

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[1] A pioneer of flight who carried out many important experiments in gliding. It was in the course of one of these experiments that he met his death.

From the writings and lectures of Wilbur Wright it is possible to follow the progress of their work without difficulty. . . . From the very outset the brothers realized that all the pioneers had been handicapped, in varying degrees, by one thing—namely, lack of experience in handling a machine in the air. Lilienthal's death had been due to this very cause.

"It seemed to us," Wilbur stated in the lecture already mentioned:

> that the main reason why the problem had remained so long unsolved was that no one had been able to obtain any adequate practice. We figured that Lilienthal in about five years of time had spent about five hours of actual gliding through the air. The wonder was not that he had accomplished so little, but that he had accomplished so much. It would not be considered at all safe for a bicycle rider to attempt to ride through a crowded city street after only five hours' practice, spread out in bits of ten seconds each over a period of five years; yet Lilienthal with this brief practice was remarkably successful in meeting the fluctuations and eddies of wind gusts. We thought that if some method could be found by which it would be possible to practise by the hour instead of by the second there would be the hope of advancing the solution of a very difficult problem. It seemed feasible to do this by building a machine which would be sustained at a speed of eighteen miles per hour, and then finding a locality where winds of this kind were common.

The Wrights, therefore, after their preliminary study of aeronautical literature, during which time they were, so to say, surveying the problem from a distance and meditating how best to approach it, decided that the first thing to do was to build a glider. They condemned as "wasteful and extravagant" any method which included the construction of a machine before one knew how to fly it, "mounting delicate and costly machinery on wings which no one knew how to manage." Their decision could not have been such a simple one as it now appears. In 1896 Lilienthal had been killed, and Chanute, after limited successes, had abandoned his experiments: in the following year Percy Pilcher met his death in England. Gliding, in the face of such events, was not the kind of hobby to which one would lightly turn: how much more reasonable, if one must dabble in aeronautical research, to confine one's activities to the experimental shop and the construction of model machines. Such considerations did not appeal to the Wrights. For some little time they studied the flight of birds, hoping to gather some suggestion of the means by which they secured their balance. They came to the conclusion that this was done instinctively, the result of inherited aptitude and constant practice. So too it must be, in part, if men were to fly, they concluded.

"Now, there are only two ways of learning to ride a fractious horse," wrote Wilbur Wright with caustic humour:

> one is to get on him and learn by actual practice how each motion and trick may best be met; the other is to sit on a fence and watch the beast awhile and then retire to the house and at leisure figure out the best way of overcoming his jumps and kicks. The latter system is the safer, but the former, on the whole, turns out the larger proportion of good riders. It is very much the same in learning to ride a flying-machine; if you are looking for perfect safety you will do well to sit on a fence and watch the birds, but if you really wish to learn you must mount a machine and become acquainted with its tricks by actual trial. . .

As the result of information provided by the Weather Bureau at Washington they decided to carry out their first experiments at Kitty Hawk, near the Atlantic coast of North

Carolina, where steady winds favourable to gliding might be expected. They pitched their camp in the summer of 1900. The death of Pilcher, following that of Lilienthal, led them to think that the dangers of gliding made it an unreliable method of experiment, and they attempted at first to attach a line to their machine and fly it as a kite. The results showed them that some of their expectations, based on Lilienthal's figures, could not be realized; but in the main this system proved inadequate, and they decided that actual gliding flights must be undertaken if real progress was to be made. They moved a distance of four miles to the Kill Devil Sand Hills and there began to practise short gliding flights without mishap.

They proceeded at first with extreme caution, making their glides as near the ground as possible, and doing everything to eliminate unnecessary risk. They knew that they must learn to walk before they could run; and they knew, moreover, quite apart from the natural instinct of self-preservation, that the security of their lives was the prime essential to the success of their project. The unavoidable risks of their enterprise were sufficiently grave; to have neglected any precaution, whether out of carelessness or foolish bravado, would have seemed to them the essence of inefficient workmanship. The foremost necessity was that they should retain their lives for the continuance of the task.

Wilbur Wright has given an account of this first year's practical work:

> The slope of the hills was 9.5 degrees, or a drop of one foot in six. We found that after attaining a speed of about twenty-five to thirty miles with reference to the wind, or ten to fifteen miles over the ground, the machine not only glided parallel to the slope of the hill, but greatly increased its speed, thus indicating its ability to glide on a somewhat less angle than 9.5 degrees, when we should feel it safe to rise higher from the surface. The control of the machine

> proved even better than we had dared to expect, responding quickly to the slightest motion of the rudder. With these gliders our experiments for the year 1900 closed. Although the hours of practice we had hoped to obtain finally dwindled down to about two minutes, we were very much pleased with the general results of the trip, for, setting out as we did with almost revolutionary theories on many points and an entirely untried form of machine, we considered it quite a point to be able to return without having our pet theories completely knocked on the head by the hard logic of experience, and our own brains dashed out into the bargain. . . .
>
> [Further experiments with gliders were made in 1901 and again in 1902, when various improvements were carried out.]

The Wrights had now devised a flying-machine which was capable of flight and amenable to control. All that remained was to supply it with an adequate motive power. In comparison with what they had already done, this was a simple task. They turned to it, nevertheless, with the same zest and thoroughness that had characterized their previous work. Before describing the final stage of their efforts, however, it may be well to give a brief description of the 1902 glider to which they were prepared to pin their faith in the attempt to attain sustained power-driven flight.

It was a biplane, the two main wings being 32 feet in frontal width (span) and 5 feet in depth (chord), giving a total supporting surface of about 305 square feet. The pilot lay horizontally across the middle of the lower plane. The so-called 'horizontal rudder' in front had a sustaining area of 15 square feet, and the rear vertical rudder had an area of 6 square feet. Skids were used as an undercarriage to support the weight of the machine on the ground. The weight of the machine itself, without the pilot, was 116½ lb.

It took the brothers rather more than twelve months to build a suitable engine and devise an efficient screw propeller by means of which its power could be made to react on the air. As Langley had discovered, no suitable engine was yet in existence. The efficiency of the internal combustion engine had been steadily growing during the latter half of the nineteenth century, and during its last decade, chiefly as the result of the work of Daimler, who since 1882 had been perfecting a light petrol engine for use in the motor-car, was beginning to assume something like its present form. It was still far too heavy, however, to be applied to aircraft. The Wrights realized that the weight per horse-power developed must be drastically reduced, whilst the strength and reliability must be retained. At the present day it is not utterly impossible to find large engineering firms with a big capital, stimulated by trade competition, who may be willing to experiment with strange and unfamiliar designs. In 1902 this was quite impossible. There were no wealthy firms engaged in producing combustion engines by the thousand, to whom experiment was part of the day's work. Moreover, it was an article of the engineer's faith that weight and reliability could not be divorced, and engineers do not readily abandon their cherished beliefs. Another difficulty lay in the fact that existing factory plant was far more limited and unadaptable than it is to-day. Like Langley and earlier pioneers, the Wrights were compelled to design and construct their own engine.

The fact that in a year they succeeded in designing and constructing an engine giving thirty horse-power and weighing only 7 lb. per horse-power was in itself an accomplishment that might secure them a degree of fame. Indeed, their work in this connexion—like the equally meritorious achievement of Langley's assistant, Charles Manly—constitutes an engineering feat that only the more momentous success it made possible could have dwarfed to comparative insignificance. The difficulties involved in designing a suitable screw propeller might have confounded less resourceful and determined men.

At last, towards the end of 1903, all was ready. A new machine had been built similar to the successful one of the previous year. As they found that their engine developed more power than they had anticipated, they utilized the extra weight allowed them in strengthening the general structure. Once more they visited Kitty Hawk and fitted the engine to the new machine. After a few practice flights on the old glider they prepared for the great test. A general invitation to be present at the trial was extended to the inhabitants of the district, but few responded. "Not many were willing to face the rigours of a cold December wind in order to see, as they no doubt thought, another flying-machine *not* fly." Five gentlemen turned up to witness the conquest of the air. They were Mr A. D. Etheridge, Mr W. S. Dough, Mr W. C. Brinkley, Mr John Ward, and Mr John T. Daniels. Little would they think, as they came to the level ground north of the Kill Devil Hill, impelled probably more by casual curiosity or friendliness towards the young inventors than by any real interest in aeronautics, what an epoch-making event they were to see. For a truly epoch-making event was about to take place. Sir Walter Raleigh, in the first volume of *The War in the Air*, quotes the description of this famous morning, written by Orville Wright for the Aeronautical Society of Great Britain. It is a concise and unadorned narrative.

> On the morning of 17th December, between the hours of 10.30 o'clock and noon, four flights were made, two by Mr Orville Wright and two by Mr Wilbur Wright. The starts were all made from a point on the levels, and about 200 feet west of our camp, which is located about a quarter of a mile north of the Kill Devil Sand Hill, in Dare County, North Carolina. The wind at the time of the

flights had a velocity of 27 miles an hour at 10 o'clock and 24 miles an hour at noon, as recorded by the anemometer at the Kitty Hawk weather bureau station. This anemometer is 30 feet from the ground. Our own measurements, made with a hand-anemometer at a height of four feet from the ground, showed a velocity of about 22 miles when the first flight was made and 20½ miles at the time of the last one. The flights were directly against the wind. Each time the machine started from the level ground by its own power alone, with no assistance from gravity or any other sources whatever. After a run of about 40 feet along a mono-rail track, which held the machine eight inches from the ground, it rose from the track and under the direction of the operator climbed upward on an inclined course till a height of eight or ten feet from the ground was reached, after which the course was kept as near horizontal as the wind gusts and the limited skill of the operator would permit. Into the teeth of a December gale the *Flier* made its way forward with a speed of ten miles an hour over the ground, and 30 to 35 miles an hour through the air. It had previously been decided that, for reasons of personal safety, these first trials should be made as close to the ground as possible. The height chosen was scarcely sufficient for manœuvring in so gusty a wind and with no previous acquaintance with the conduct of the machine and its controlling mechanisms. Consequently the first flight was short. The succeeding flights rapidly increased in length, and at the fourth trial a flight of 59 seconds was made, in which time the machine flew a little more than half a mile through the air and a distance of 852 feet over the ground. The landing was due to a slight error of judgment on the part of the operator. After passing over a little hummock of sand, in attempting to bring the machine down to the desired height the operator turned the rudder too far, and the machine turned downwards more quickly than had been expected. The reverse movement of the rudder was a fraction of a second too late to prevent the machine from touching the ground and thus ending the flight. The whole occurrence occupied little, if any, more than one second of time.

Only those who are acquainted with practical aeronautics can appreciate the difficulties of attempting the first trials of a flying-machine in a 25-mile gale. As winter was already well set in we should have postponed our trial to a more favourable season, but for the fact that we were determined, before returning home, to know whether the machine possessed sufficient power to fly, sufficient strength to withstand the shocks of landings, and sufficient capacity of control to make flight safe in boisterous winds, as well as in calm air. When these points had been definitely established we at once packed our goods and returned home, knowing that the age of the flying-machine had come at last.

Wilbur Wright, writing in the *Century Magazine* in 1908, accurately describes the first of the four flights, that lasted twelve seconds, as "the first in the history of the world in which a machine carrying a man had raised itself into the air by its own power in free flight, had sailed forward on a level course without reduction of speed, and had finally landed without being wrecked."

Thus at last man had learned to fly. The hopes of many faithful workers were rewarded not, as it had so often seemed, with failure but with success. The beginnings, it is true, were modest and not very spectacular, like the first uncertain flight of a nestling, but they were the certain beginnings of a mighty conquest, the full meaning and extent of which one can even now only dimly imagine. Man had added one more to the long tale of his triumphs over his natural surroundings.

C. L. M. BROWN, *The Conquest of the Air*

FIRST ATLANTIC FLIGHT

THE first attempt to cross the Atlantic by air was made in 1873, when three Americans started off in a balloon. This rash effort ended, rather ignominiously, in a crash before they had even reached the sea. It was nearly forty years before the venture was again undertaken. In 1910 an American airship, with a crew of six, set out across the ocean. But trouble with the 70-80 horse-power engine forced the airmen to give up, after four days of helpless drifting. They managed to descend near a passing steamer, and were picked up ; the airship was never seen again.

After the Great War, and the consequent great development in aircraft construction, it was the turn of the aeroplane. On May 16, 1919, three American Navy flying-boats set off from Newfoundland, and one of them succeeded in reaching Lisbon. But the journey had been made via the Azores, so that, creditable though it was, this was not a non-stop flight from the American coast to the European.

Soon after the Americans had started, two Englishmen, Harry Hawker and Mackenzie Grieve, began the non-stop flight from Newfoundland to Ireland. Engine trouble (this time in the cooling system of the 360-H.P. Rolls Royce engine) was again the cause of failure. They alighted near a fishing vessel, and reached land after the world had given them up for lost.

Nearly two months later another British team in Newfoundland joined in the attempts—Captain John Alcock and Lieutenant A. Whitten Brown in a Vickers "Vimy" equipped with two 360 H.P. Rolls Royce engines. Alcock, aged twenty-seven, was an experienced pilot ; Brown, aged thirty-three, was an expert navigator, in days when aerial navigation was in its infancy. No better qualified pair could have been found for the daring attempt. The following account tells how they succeeded, and thereby made aeronautical history.

THE "Vimy" was ready on Friday, the 13th of June—a combination of day and date on which no sailor could have been induced to start. It was not until the afternoon that the strong wind blowing athwart their longest runway abated; but soon after five o'clock they decided it had dropped sufficiently to start.

The great raking biplane, which can now be seen in the South Kensington Museum, was filled with eight hundred and sixty-five gallons of petrol—weighing over three tons. Its long, angular fuselage, thin wing section, large struts, and multitude of wires make it look quaint to-day; and its size is dwarfed by all but the smallest of modern air liners; but in those days it was as large as any bomber in regular service, and as fast and shapely as any twin-engined aeroplane of its time.

The fuselage was wide enough for the two pilots to sit side by side in the open cockpit in front. This was an advantage, for the two men could converse easily when Brown wished to give Alcock his course or compare notes with him.

Alcock had little more than 1000 feet of runway in which to take off the overloaded biplane, and a cross-wind to contend with as well. But the wheels were clear after 900 feet, and then the "Vimy" staggered slowly down the valley which lay ahead of her. The air, eddying over the crest of the valley, made her rock and wallow, and the spectators gasped; but Alcock kept her low until he had reached the end of the dip, then turned into wind, and climbed painfully to the few hundred feet necessary to clear the headland of St John's. A few minutes after, when they were at a safe height and well out to sea, Brown gave Alcock his course.

Conditions seemed good when they started. A 38 M.P.H. wind romped behind them, saving petrol with every mile per hour it added to their speed. But almost immediately they met their first misfortune. The driving shaft of the electric generator sheared; their wireless went out of action, and they were cut off from the world. Unable now to call for help should trouble come, they set out into the unknown. Below, the steady breeze flicked the Atlantic waves into white caps. While this lasted Brown could take drift sights off the white splashes. Then the Newfoundland fog-banks swallowed them up.

For the next seven hours they plunged steadily through fog. This was a time of anxiety for Whitten Brown, for while it lasted he was flying by dead reckoning—that is, basing his estimates on compass course, time elapsed, and air speed. Huge errors are possible in aerial dead reckoning if the wind changes, and in seven hours those errors might accumulate to such an extent as to throw him far off his course, so far as to be beyond all hope of ever reaching land.

While Brown anxiously checked and re-checked his calculations, Alcock devoted all his energies to the difficult task of keeping a steady course with a horizon and ocean blotted out for long periods. Even to an experienced pilot this is a task demanding all his attention, and as the hours passed the strain must have become almost unendurable.

Brown had hoped to get some chance of using his sextant before now, but all the time the sun had been invisible. Occasionally, however, they could see the white caps of the waves, driven by their helpful tail wind, or, sometimes, an iceberg. By sighting on these, Brown was able to get a check on his drift. With those checks he had to be content.

They had intended to be out of the fog-banks when night fell, but their late start had prevented this. As night closed in they were still deep in rolling banks of mist, and the lack of light added to Alcock's difficulties. His best clue as to whether they were diving or climbing was now the air-speed indicator. If their speed rose, they were diving; if it fell back, they were climbing. He kept his eyes fixed on the flickering needle, while Brown checked and re-checked his calculations.

The night brought a new anxiety to Brown also, for it was now no longer possible to see the ocean with sufficient distinctness to check drift. He was flying entirely by dead reckoning.

At midnight the weather improved. Never had stars been more welcome than those old friends of the sailor, Vega and the Pole Star, which came into view above a horizon flecked with moonlit clouds as the "Vimy" climbed slowly into better weather. Brown stood up, holding the sextant in his frozen fingers, and took the necessary sights. The icy blast chewed his face like a whip-lash, but the sights confirmed that the good ship "Vimy" was holding on her course.

The improvement in weather did not last long. Less than half an hour after the sights had been taken they ran into thick clouds, and with the clouds came gusts in which the huge biplane pitched and rolled like a steamer. They were laden with sleet, and soon the pitot tube of the air-speed indicator was frozen, so that the dial no longer registered their speed. Thus Alcock's blind-flying guide failed him. The horizon was blotted out; the sea was invisible; and as they dropped and wallowed in the bumpy air, it was impossible for the pilot to correct the deviations with certainty.

Under these conditions they groped their way, 4000 feet above the Atlantic, blind and helpless. Many years later Dole Derby fliers in like circumstances over the Pacific were engulfed by disaster. And the "Vimy" too had what is probably the narrowest escape ever experienced by transatlantic fliers who survived to tell it. They found themselves in a spin.

A spin is unpleasant and dangerous enough if it occurs involuntarily in a fighter, a machine which is meant to be spun. But in a large twin-engined aeroplane, which is not built for such manœuvres, and in a cloud, without horizon or instruments to guide him, the most experienced of pilots is helpless. Alcock strove with stick and rudder to correct the spiral, but with no horizon to steady it on the "Vimy" dropped one wing in an ever-tightening spiral which flicked into a spin, was altered to a dive, changed to a spin, and was again frantically corrected by Alcock. While they were in a steep dive of recovery they emerged from the cloud, and they saw, glistening faintly in the moonlight, above the diving nose of the "Vimy," the angry waves of the Atlantic. In another moment these waves would have engulfed them, but that moment was sufficient for Alcock. He righted the aeroplane.

What exactly happened in that terrifying slide oceanwards neither of the airmen was afterwards able to tell, owing to the very lack of a horizon which caused it; but Alcock was inclined to think that at one time they performed a complete loop, and that for a part of the descent the aeroplane was on its back.

The cloud was too low for them to continue to fly beneath it. The danger of flying through it had already been revealed. They decided to climb above it, and Alcock again showed his skill in climbing, by feel alone, through the dark interior of the cloud, on and up into clearer weather, 7000 feet high.

Here the cold was intense. Their fingers and faces froze, and ice and sleet coated the aeroplane. In such circumstances aeroplanes have often been forced down, the ice forming so rapidly on the wing as to rob it of 'lift.' But this they escaped, although they had a moment's anxiety when, for a time, the stick became immovable sideways; the aileron hinges had frozen. But at least the wind, however it might shift, always blew from behind, helping them on, even though it sent with them the bad weather which was causing so much anxiety. Even at the height at which they were flying, visibility was barely good enough to enable Alcock to keep on an even keel. They were forced steadily up, into the biting cold, but still the cloud rack followed them, and only occasionally was Brown able to take a sight of the moon.

At last the long-hoped-for dawn came—soon after six. Now they climbed yet higher—to 11,000 feet—and snatching a 'shot' of the sun through the scudding clouds, Brown was at last able to get a reliable check on their position, which told him their task was nearly completed. This done, they descended and skimmed between the clouds and the ocean.

Lower down the wind changed, as Brown found after taking some drift sights off the waves. Course was therefore altered. Nearly an hour later they identified two islands as being five miles out from Galway, Ireland; and never could solid land have seemed so welcome as to the weary airmen. The mainland itself remained hidden in drifting veils of mist and rain. Suddenly some hills loomed out of the vapour, and with a feeling of intense relief the airmen knew that their task had been accomplished; they had crossed the Atlantic non-stop.

Presently the tall masts of Clifden wireless station came into view. They circled the station and fired Very lights without result, nor did any one in the town of Clifden see them as they flew round the town seeking a landing-place. The weather was getting worse, and Alcock decided to land in the first suitable field, instead of pushing on to England. There was a pleasant-looking green field near the wireless station, but the greenness was that of a bog, and the 'plane nosed over as it came to rest. Fortunately neither airman was injured.

The operators, hearing the aeroplane landing, rushed from the station to greet the pilots. They asked Alcock and Brown what time they had left *England*, and told them that no word had as yet come from the transatlantic fliers; for they assumed at once that these two airmen had come from England to greet them. Their astonishment, when they learned who the airmen really were, may be imagined!

The actual time from coast to coast—a distance of just under 1900 miles—was 15 hours 57 minutes. This gives the remarkable speed of 110 miles per hour, and was only possible in the slow "Vimy" because of the following wind. Actually this was a record which stood for many years, even when pilots such as Lindbergh and Chamberlin, with much faster aeroplanes, made the crossing. Alcock and Brown, however, had not depended on this wind to get across, as is proved by the fact that after landing in Ireland enough petrol remained in the tanks for ten more hours' flying—about 850 miles in still air.

The airmen won the *Daily Mail* prize of £10,000, and were knighted for their achievement. England had not yet recovered from its jubilation over the safety of Hawker, and by comparison the rejoicing over this fine success was moderate. Alcock himself did not long survive his triumph. He was killed when a machine he was delivering crashed in France. Brown still lives, but is so indomitably modest that only once since that time has he been persuaded to appear at any public function—at the tenth anniversary of the flight in 1929. His retiring, studious personality reminded the guests that the air hero is apt to be different from the aggressively romantic figure of fiction.

Whether it was due to the modesty of the airmen or to other causes as well, this great achievement has undoubtedly lacked its due meed of praise. Millions of people believed, when Lindbergh crossed in 1927, that this was the first non-stop crossing of the Atlantic; indeed, many Americans believe so to-day. But the worth of an achievement does not depend on its fame, and the flight undertaken by Alcock and Brown, because of the skill with which the aircraft was piloted and navigated and of the success achieved, remains one of the epics of air history, the prototype of all that a long-distance flight should be.

C. ST JOHN SPRIGG, *Great Flights*

COURAGE IN THE AIR

The days have passed when a flight from one side of the Atlantic to the other stood out as an example of initiative and daring. Thanks to the early pioneers, Atlantic flights have now become an everyday story. But there will always be room for great feats of endeavour in the air; and the following extract from an official account of R.A.F. exploits is one among many examples of the kind of courage which may continue to be called upon, in peace as well as in war, so long as man retains the power to fly.

A plane returning from a flight over Germany during the war was struck by shrapnel, and the wing set on fire. The second pilot, a sergeant-pilot from New Zealand, crawled out on to the wing, put out the flames, and made his way back to the fuselage, in spite of the terrific force of wind beating against him. The incident is related by the performer himself in the casual, nonchalant vein not uncharacteristic of such men. He tends to slur over the hazardous nature of his achievement; but it will not be difficult to read between the lines and appreciate the exploit at its true worth. It may be added that the airman was awarded the V.C. for conspicuous bravery on this occasion. After a later flight, sad to say, he was reported 'missing.'

It was on one of the Munster raids that it happened. It had been one of those trips that you dream about—hardly any opposition over the target; just a few searchlights, but very little flak. . . . As second pilot I was in the astro-dome keeping a look-out all round. All of a sudden, over the middle of the Zuider Zee, I saw an enemy machine coming in from port. I called up the pilot to tell him, but our intercom. had gone phut. A few seconds later, before anything could be done about it, there was a slamming alongside us and chunks of red-hot shrapnel were shooting about all over the place.

As soon as we were attacked the squadron leader who was flying the plane put the nose down to try and dive clear. At that time we didn't know that the rear gunner had got the attacking plane, a Messerschmidt 110, because the inter-com. was still out of action and we couldn't talk to the rear turret.

We'd been pretty badly damaged in the attack. The starboard engine had been hit and the hydraulic system had been put out of action, with the result that the undercarriage fell right down: which meant, of course, that it would be useless for landing unless we could get it right down and locked. The bomb doors fell open too; the wireless sets were not working, and the front gunner was wounded in the foot. Worst of all, fire was burning up through the upper surface of the starboard wing, where a petrol feed pipe had been split open. We all thought we'd have to bale out, so we put on our parachutes. Some of us got going with the fire extinguisher, bursting a hole in the side of the fuselage so that we could get at the wing, but the fire was too far out along the wing for that to be any good. Then we tried throwing coffee from our flasks at it, but that didn't work either. It might have damped the fabric round the fire, but it didn't put the fire out.

By this time we had reached the Dutch coast and were flying along parallel with it, waiting to see how the fire was going to develop.

The squadron leader said, "What does it look like to you?" I told him the fire didn't seem to be gaining at all and that it seemed to be quite steady. He said, "I think we'd prefer a night in the dinghy in the North Sea to ending up in a German prison camp." With that he turned out seawards and headed for England.

I had a good look at the fire, and I thought there was a sporting chance of reaching it by getting out through the astro-dome, then down the side of the fuselage and out on to the wing. Joe, the navigator, said he thought it was crazy. There was a rope there; just the normal length of rope attached to the rubber dinghy to stop it drifting away from the aircraft when it's released on the water. We tied that round my chest, and I climbed up through the astro-dome. I still had my parachute on. I wanted to take it off because I thought it would get in the way, but they wouldn't let me. I sat on the edge of the astro-dome for a bit, with my legs still inside, working out how I was going to do it. Then I reached out with one foot and kicked a hole in the fabric so that I could get my foot into the framework of the plane, and then I punched another hole through the fabric in front of me to get a hand-hold; after which I made further holes and went down the side of the fuselage on to the wing. Joe was holding on to the rope so that I wouldn't drop straight off.

I went out three or four feet along the wing. The fire was burning up through the wing rather like a big gas jet, and it was blowing back just past my shoulder. I had only one hand to work with getting out, because I was holding on with the other to the cockpit cover. I never realized before how bulky a cockpit cover was. The wind kept catching it, and several times nearly blew it away and me with it. I kept bunching it under my arm; then out it would blow again. All the time, of course, I was lying as flat as I could on the wing, but I couldn't get right down close because of the parachute in front of me on my chest. The wind kept lifting me off the wing. Once it slapped me back on to the fuselage again, but I managed to hang on. The slipstream from the engine made things worse. It was like being in a terrific gale, only much worse than any gale I've ever known in my life.

I can't explain it, but there was no sort of real sensation of danger out there at all. It was just a matter of doing one thing after another, and that's about all there was to it.

I tried stuffing the cockpit cover down through the hole in the wing on to the pipe where the fire was starting from, but as soon as I took my hand away the terrific draught blew it out again; and finally it blew away altogether. The rear gunner told me afterwards that he saw it go sailing past his turret. I just couldn't hold on to it any longer.

After that there was nothing to do but to get back again. I worked my way back along the wing, and managed to haul myself up on to the top of the fuselage and got to sitting on the edge of the astro-dome again. Joe kept the dinghy rope taut all the time, and that helped. By the time I got back I was absolutely done in. I got partly back into the astro-hatch, but I just couldn't get my right foot inside. I just sort of sat there looking at it until Joe reached out and pulled it in for me. After that, when I got inside, I just fell straight on the the bunk and stayed there for a time. . . .

Just when we were within reach of the English coast the fire on the wing suddenly blazed up again. What had happened was that some petrol which had formed a pool inside the lower surface of the wing had caught fire. I remember thinking to myself, "This is pretty hard after having got as far as this." However, after this final flare-up the fire died right out—much to our relief, I can tell you.

The trouble now was to get down. We pumped the wheels down with the emergency gear and the pilot decided that, instead of going to our own base, he'd try to land at another aerodrome nearby which had a far greater landing space. As we circled before landing he called up the control and said, "We've been badly shot up. I hope we shan't mess up your flare-path too badly when we land." He put the aircraft down beautifully, but we ended up by running into a barbed-wire entanglement. Fortunately nobody was hurt, though, and that was the end of the trip.

SERGEANT-PILOT, R.N.Z.A.F., *We Speak from the Air*

THE FIRST STRATOSPHERE ASCENT

Many attempts have been made in this century to investigate the stratosphere—the region extending from about ten to thirty miles above the earth. Until recent years the stratosphere was unknown to man, except through information revealed by small 'sounding' balloons sent up with instruments attached. Efforts were made by various men to travel to this remote area above the earth, but until 1931 all failed to achieve their objective. In that year, however, Professor Auguste Piccard, of Brussels University, successfully ascended to a height of 51,775 feet. Since then even greater heights have been reached by balloonists, including Professor Piccard himself and his brother, Dr Jean Piccard, who ascended with his wife to over 57,000 feet. In November 1935 Captain Stevens and Captain Anderson (U.S.A.) reached the record height of 72,395 feet.

The balloon in which Professor Piccard made his first ascent was thirty-three yards in diameter; below this was the spherical aluminium gondola—hermetically sealed and supplied with oxygen—in which Professor Piccard and his assistant were to travel.

By the end of August 1930 Professor Piccard was ready to make his flight into the stratosphere. As a starting-place he chose the flying-fields of Messrs Riedinger, at Augsburg, Bavaria—the firm who manufactured his balloon.

With all long-distance flights in non-dirigible balloons it is desirable to avoid the possible danger of a sea-landing, and Augsburg, being situated at a considerable distance from any large body of water, was admirably suited for his purpose. . . .

At last, after long months of weary waiting,[1] conditions once more appeared hopeful on 26th May, 1931. The balloon was accordingly once more spread out, and about midnight filling was begun.

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[1] The first attempt, in the preceding September, had to be suddenly cancelled owing to weather conditions.

On the morning of the next day, 27th May, all was ready, but the wind was again very troublesome—on one occasion blowing the aluminium gondola from its truck as it was being conveyed across the aerodrome. As a result it sustained several bad dents and its cargo of instruments was jolted out of adjustment.

In spite of this bit of bad luck and the doubtful conditions for the flight, Professor Piccard determined to carry on. He had intended starting about 5 A.M., but as the weather seemed to be worsening, an earlier start was decided upon. At 3.30 A.M. he and Mr Paul Kipfer, his assistant, climbed into the gondola, and the manholes were closed from within.

Once inside they busied themselves putting the various instruments in order, while waiting for the signal telling them that the command "Let go everything" was about to be given.

Owing to some misunderstanding this was not done, and at 3.57 A.M. the balloon was released without their knowledge. They were only conscious of the fact that their journey had started when Mr Kipfer, happening to glance through one of the portholes, saw a factory chimney-stack beneath him!

Their departure was witnessed by thousands of people who had congregated to witness the start. The balloon rose almost vertically, until it was a gleaming globule in the rays of the sun not yet risen. It quickly attained a height of 6500 feet, disappearing shortly afterwards in a southerly direction, eventually to hover ten miles above the earth.

It was expected that Professor Piccard and his assistant would land about 2 P.M., but when the balloon was last seen, about 7 P.M. near Garmisch, they seemed to be taking no steps to descend and some anxiety was felt as to their oxygen supply. So far as was known, this was sufficient for only ten hours, and the altitude of the balloon was well above the point where natural breathing would be possible.

All day long the silver speck in the sky, now vanishing, now swimming into sight again miles away, had most of Europe agog. But it was staying up too long. Evidently *it would not come down*!

Fearing there had been some failure in the valve, or some other cause which prevented their descent, an aeroplane set out from Munich aerodrome at 7.45 P.M. in pursuit of the balloon. They located it over Landeck, in the Tyrol, about 9 P.M., but were unable to rise to half the height of the balloon or to establish communication with it.

About this time the villagers of Gurgl, in the Oetzwald Tyrol, also saw the balloon hovering above them, but soon after it was lost to sight behind a cloud. When last seen by them it seemed to be going in the direction of Italy.

Such was the state of affairs as known to the outside world up to 9 P.M. on the day of the flight. We will now take up the story from the point of view of its occupants from the time the balloon left Augsburg at 3.57 A.M., and see how those hardy adventurers were faring.

Owing to the way in which the balloon had been tossed about prior to the start, various instruments in the gondola had suffered somewhat, and damage was also sustained by the gondola whilst moving one of the instruments into its position inside.

It has been mentioned that, while the stratonauts were busy inside getting things in order, the balloon was released without their knowledge. This was a cause of great chagrin to Professor Piccard, for he had long looked forward to the day when he should witness, from a porthole in the gondola, the start of his great experimental flight into the upper realms of the atmosphere

As soon as Professor Piccard became aware their journey had started he at once set about closing the last link between the gondola and the outside world—just a tiny hole one inch in diameter. This had been left open to accommodate an electrostatic sounding instrument, which, since it fitted in a hole in the bottom of the gondola, could not be set into position prior to the start. His efforts in this direction proved unsuccessful, owing to the damage the gondola had sustained when it was blown off its truck. He found the rim of the hole had been bent and it would not take the fitting.

While this discovery was being made the balloon was ascending rapidly; and matters soon became serious, for the precious air of the cabin was rapidly escaping. Something had to be done, and done quickly, otherwise there lay no other course than to valve the balloon, and check the ascent that way. Little did they know then that this one and only safeguard was not open to them, since the release valve, through the twisting of the valve rope at the time of taking off, could not be made to function!

At 15,000 feet Kipfer announced that the interior altimeter marked the same altitude, so that for all practical purposes they might just as well have been in an open wicker basket. All the advantages they had hoped to have gained from their wonderful sealed gondola seemed likely to prove of naught.

At this juncture Kipfer lent a hand, and by a vigorous effort succeeded in forcing the electrostatic recording instrument into its hole, breaking its quartz insulation in doing so, but not preventing the escape of air, which now made a whistling noise.

Fortunately a reserve of liquid oxygen was available, and by pouring some of the liquid on the floor of the gondola, the rapid evaporation of the oxygen, by replacing the escaping air, at a greater rate, temporarily prevented any further drop in internal pressure in the gondola.

Quickly now Professor Piccard tried to smear a mixture of oakum and vaseline around the leak, but it proved a difficult task, as it was situated in an almost inaccessible place under a board in the floor. Gradually as he applied more and more of the mixture, the whistling decreased, until finally came a blessed and wonderful silence. The leak had been stopped and all was well. They were now airtight, after 28 minutes of frantic labour. And their present altitude was 9.65 miles! From the moment of the start they had shot upwards at an average rate of 20 miles an hour—not a great rate for a motorist, perhaps, but for going straight upwards quite a different matter.

Now for the first time the stratonauts were free to observe their surroundings. Up to this stage they had been so busy stopping the air leak and in replacing instruments misplaced when the gondola turned over, that they had had no opportunity of making the scientific observations at various altitudes, as intended, or of observing the scene of almost fairy-like beauty beneath them.

All around them was a beautiful deep purple, from which the sun shone out with cold brilliance. The sun, rising above the horizon, was not yet visible on the earth beneath. Below them stretched a view whose theoretical area was 560 square miles, but mists prevented other than occasional glimpses. Sometimes the wonderful picture thus presented to their gaze would be that of a flat plain, perfect in every detail. At other times it sparkled up in cameo relief. Particularly striking was the view of the many interwoven chains of the Bavarian and Austrian Alps. The Rhine looked like a silver thread winding away into the dim distance. Looking aloft, the balloon, which at the start had been an ungainly pear-shaped figure with overhanging folds, was now a thing of beauty, fully expanded to a perfect sphere and illumined by the rising sun. And the moon—even at midday—was a brilliant object in the sky and appeared far more clearly than it usually does from the earth.

The balloon was now levelled off to a height of 15 kilometres (9.3 miles) and scientific observations were begun in real earnest, leaving the stratonauts little time for enjoying the beauties of their surroundings, above and below.

Later on in the morning the disconcerting discovery was made that they were unable to descend at will, since the escape valve rope had become twisted. Fortunately the balloon was travelling very slowly, and there was little danger of drifting over sea. They knew the balloon would descend of its own accord later on in the afternoon, with the cooling temperature due to the setting of the sun, but this unexpected prolongation of their flight now caused them considerable anxiety regarding their oxygen supply, which from now on was carefully conserved.

Another unexpected and unforeseen trouble also arose. The motor designed to turn the gondola upon its axis refused to work, owing to a short-circuit probably caused by the jerk as they left the ground. Professor Piccard's plan for regulating the heat of the gondola was to turn the bright or dark side of the gondola alternatively towards the sun, but since the motor would not now function this was not possible. As the black side kept constantly facing the sun, the heat inside the gondola steadily rose until it soon became unbearably hot.

The higher the balloon went, the hotter it became! Sunset was still five hours away. Finally the two stratonauts were compelled to strip off their clothes and work in a semi-nude state, so excessive was the heat.

Outside, in the airless space, the temperature was about 100 degrees of frost, but inside the temperature rose higher and higher until it reached a maximum of 104 degrees Fahrenheit, and this, coupled with the fact that their supply of drinking water had become exhausted, caused the stratonauts great suffering from heat and thirst.

And to add still further to their troubles, the excessive heat warped the rubber joints of the manholes, so that they became no longer airtight. As a result the internal pressure of the gondola steadily fell, adding still further to their anxieties. Pressure could only be restored by expending more and more of their precious oxygen, which, as already explained, they had every need to conserve.

Realizing the difficulty of making a landing without using the escape valve, they decided to conserve their ballast to help matters. Contrary to what is generally believed, the primary function of ballast in a stratosphere balloon flight is to facilitate a safe landing, not to increase ascent. So far they had used only 112 kilograms of their total of 500 kilograms of lead waste taken as ballast, and although by further dumpings they might have exceeded their maximum altitude by as much as 800 metres, safety considerations for their landing dictated otherwise.

As anticipated, the balloon commenced to sink slowly in the early afternoon, but their rate of fall was only about 100 feet an hour, and at this rate it would have taken them three weeks to get down to earth. Five, six, and even seven o'clock went by without any appreciable increase in the rate of falling, and their anxiety over their oxygen supply became greater and greater.

Sunset was, however, due shortly after eight, and as the sun sank lower and lower, the rapidity of their descent increased, until at 8 P.M. they were down to within 7½ miles. They comforted themselves at this stage by recalling that other aeronauts had survived this height.

As the evening lengthened the balloon continued to sink rapidly. By 8.50 they were only 2½ miles up, and it was then considered safe to open the manholes. Although they now found themselves above high mountains, they had at least the satisfaction of knowing that all danger from drifting out to sea and the greater danger of death by asphyxiation were as good as over.

From now on, luck was with them. The balloon, of its own accord, seemed deliberately to avoid surrounding crevasses and peaks—far better than they could have done themselves—and, about 9.30 P.M., it chose as a landing-place the most suitable spot for many miles around—the slanting slope of the Gross Gurgl Ferner Glacier, at an altitude of 2700 metres (8858 feet).

By thus striking the ground in a slanting direction, the balloon was able to come to rest without the danger of a violent shock which a perpendicular landing would have involved.

The stratonauts did not at once leave their gondola, but busied themselves packing up their instruments. Next they attended to the instruments attached outside the gondola; and then, after securing the balloon as best they could, they camped for the night in an improvised fashion.

In the morning they cooked themselves a meal of melted snow and Nestlé's flour, and seeing no signs of life anywhere, decided to attempt a descent into the valley below.

But before doing so it occurred to them that some flyer might observe the balloon and perhaps form the incorrect conclusion they had perished. To avoid this possibility they spread in the snow pieces of fabric to form their balloon's Swiss identification number—CH-113—weighting the figures down with little heaps of lead ballast. By this means, should their balloon be observed, they hoped to convey the message that they had left the gondola alive and conscious.

The way down was difficult, and it was fortunate that Professor Piccard had had previous experience as a mountaineer, having climbed the Silberhorn in the Eastern Alps in his younger days.

They did not follow the path over the glacier, because with a completely unknown glacier there was the danger of unexpected crevasses. Roped together, they struck out on a path of their own, and after climbing down the rocks on the other side they encountered a party of villagers from Gurgl who were coming up to their assistance.

The villagers of Gurgl, who as previously related had seen the balloon on the previous evening, again saw it early in the morning, apparently resting on a mountain ledge. Their discovery was conveyed to their school-teacher—Herr Folkner—who at once formed a rescue party consisting of himself and two others. Together they started to climb the mountain where the balloon was lying, and as they neared their goal they met the stratonauts coming down.

The meeting took place about noon, but even with the aid of the guides the party did not arrive at the village of Gurgl until 5 P.M. . . .

So ended the first real stratosphere flight—a true epic of the skies.

C. G. PHILP, *The Conquest of the Stratosphere*

ALONE IN THE BREACH

On May 10, 1940, eight months after war was declared, Mr Churchill became Prime Minister, following the invasion by Germany of Holland and Belgium. On May 14 the Dutch army was defeated and ceased fire; on May 28 King Leopold of Belgium surrendered; on June 4 the evacuation of the British army from Dunkirk was completed. A fortnight later France collapsed, and Britain stood alone against the might of Germany. For many hazardous weeks she prepared grimly for the German invasion of her shores. While the preliminary stage of this invasion, the massed air attack on Britain, was being successfully beaten back by the R.A.F., the Prime Minister, in one of his most famous addresses to Parliament (August 20), told the story of the nation's splendid struggle, single-handed, against Nazi tyranny. Here is a part of the story that he told.

Rather more than a quarter of a year has passed since the new Government came into power in this country. What a cataract of disaster has poured out upon us since then. The trustful Dutch overwhelmed; their beloved and respected sovereign driven into exile; the peaceful city of Rotterdam the scene of a massacre as hideous and brutal as anything in the Thirty Years War. Belgium invaded and beaten down; our own fine Expeditionary Force, which King Leopold called to his rescue, cut off and almost captured, escaping as it seemed only by a miracle, and with the loss of all its equipment; our Ally, France, out; Italy in against us; all France in the power of the enemy, all its arsenals and vast masses of military material converted, or convertible, to the enemy's use; a puppet Government set up at Vichy which may at any moment be forced to become our foe; the whole Western seaboard of Europe from the North Cape to the Spanish frontier in German hands; all the ports, all the airfields on this immense front employed against us as potential springboards of invasion. Moreover, the German air power, numerically so far outstripping ours, has been brought so close to our Island that what we used to dread greatly has come to pass, and the hostile bombers not only reach our shores in a few minutes and from many directions but can be escorted by their fighting aircraft. Why, Sir, if we had been confronted at the beginning of May with such a prospect, it would have seemed incredible that at the end of a period of horror and disaster, or at this point in a period of horror and disaster, we should stand erect, sure of ourselves, masters of our fate, and with the conviction of final victory burning unquenchable in our hearts. Few would have believed we could survive; none would have believed that we should to-day not only feel stronger but should actually be stronger than we have ever been before.

Let us see what has happened on the other side of the scales. The British nation and the British Empire, finding themselves alone, stood undismayed against disaster. No one flinched or wavered; nay, some who formerly thought of peace now think only of war. Our people are united and resolved, as they have never been before. Death and ruin have become small things compared with the shame of defeat or failure in duty. We cannot tell what lies ahead. It may be that even greater ordeals lie before us. We shall face whatever is coming to us. We are sure of ourselves and of our cause, and that is the supreme fact which has emerged in these months of trial.

Meanwhile we have not only fortified our hearts but our Island. We have rearmed and rebuilt our armies in a degree which would have been deemed impossible a few months ago. We have ferried across the Atlantic in the month of July, thanks to our friends over there, an immense mass of munitions of all kinds, cannon, rifles, machine-guns, cartridges and shell, all safely landed without the loss of a gun or a round. The output of our own factories, working as they have never worked before, has poured forth to the troops. The whole British Army is at home. More than 2,000,000 determined men have rifles and bayonets in their hands to-night, and three-quarters of them are in regular military formations. We have never had armies like this in our Island in time of war. The whole Island bristles against invaders, from the sea or from the air. . . .

Our Navy is far stronger than it was at the beginning of the war. The great flow of new construction set on foot at the outbreak is now beginning to come in. We hope our friends across the ocean will send us a timely reinforcement to bridge the gap between the peace flotillas of 1939 and the war flotillas of 1941. There is no difficulty in sending such aid. The seas and oceans are open. The U-boats are contained. The magnetic mine is, up to the present time, effectively mastered. The merchant tonnage under the British flag, after a year of unlimited U-boat war, after eight months of intensive mining attack, is larger than when we began. We have, in addition, under our control at least 4,000,000 tons of shipping from the captive countries which has taken refuge here or in the harbours of the Empire. Our stocks of food of all kinds are far more abundant than in the days of peace, and a large and growing programme of food production is on foot.

Why do I say all this? Not assuredly to boast; not assuredly to give the slightest countenance to complacency. The dangers we face are still enormous, but so are our advantages and resources. I recount them because our people have a right to know that there are solid grounds for the confidence we feel, and that we have good reason to feel ourselves capable, as I said in a very dark hour two months ago, of continuing the war "if necessary alone, if necessary for years." I say it also because the fact that the British Empire stands invincible, and that Nazidom is still being resisted, will kindle again the spark of hope in the breasts of hundreds of millions of down-trodden or despairing men and women throughout Europe, and far beyond its bounds, and that from these sparks there will presently come cleansing and devouring flame.

The great air battle which has been in progress over this Island for the last few weeks has recently attained a high intensity. It is too soon to attempt to assign limits either to its scale or to its duration. We must certainly expect that greater efforts will be made by the enemy than any he has so far put forth. Hostile airfields are still being developed in France and the Low Countries, and the movement of squadrons and material for attacking us is still proceeding. It is quite plain that Herr Hitler could not admit defeat in his air attack on Great Britain without sustaining most serious injury. If, after all his boastings and bloodcurdling threats and lurid accounts trumpeted round the world of the damage he has inflicted, of the vast numbers of our Air Force he has shot down, so he says, with so little loss to himself; if, after tales of the panic-stricken British crushed in their holes cursing the plutocratic Parliament which has led them to such a plight; if after this his whole air onslaught were forced after a while tamely to peter out, the Fuhrer's reputation for veracity of statement might be seriously impugned. We may be sure, therefore, that he will continue as long as he has the strength to do so, and as long as any preoccupation he may have in respect of the Russian Air Force allows him to do so.[1]

On the other hand the conditions and course of the fighting have so far been favourable to us. I told the House two months ago that whereas in France our fighter aircraft were wont to inflict a loss of two or three to one upon the Germans, and in the fighting at Dunkirk, which was a kind of no-man's-land, a loss of about three or four to one, we expected that in an attack on this Island we should achieve a larger ratio. This has certainly come true. . . .

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[1] When this speech was delivered Russia was still neutral.

The enemy is, of course, far more numerous than we are. But our new production already, as I am advised, largely exceeds his, and the American production is only just beginning to flow in. It is a fact, as I see from my daily returns, that our bomber and fighter strength now, after all this fighting, are larger than they have ever been. We believe that we shall be able to continue the air struggle indefinitely and as long as the enemy pleases, and the longer it continues the more rapid will be our approach, first towards that parity, and then into that superiority in the air, upon which in a large measure the decision of the war depends.

The gratitude of every home in our Island, in our Empire, and indeed throughout the world, except in the abodes of the guilty, goes out to the British airmen who, undaunted by odds, unwearied in their constant challenge and mortal danger, are turning the tide of the world war by their prowess and by their devotion. Never in the field of human conflict was so much owed by so many to so few. All hearts go out to the fighter pilots, whose brilliant actions we see with our own eyes day after day; but we must never forget that all the time, night after night, month after month, our bomber squadrons travel far into Germany, find their targets in the darkness by the highest navigational skill, aim their attacks, often under the heaviest fire, often with serious loss, with deliberate careful discrimination, and inflict shattering blows upon the whole of the technical and war-making structure of the Nazi power. On no part of the Royal Air Force does the weight of the war fall more heavily than on the daylight bombers who will play an invaluable part in the case of invasion, and whose unflinching zeal it has been necessary in the meanwhile on numerous occasions to restrain. . . .

I do not think it would be wise at this moment, while the battle rages and the war is still perhaps only in its earlier stage, to embark upon elaborate speculations about the future shape which should be given to Europe, or the new securities which must be arranged to spare mankind the miseries of a third World War. The ground is not new; it has been frequently traversed and explored, and many ideas are held about it in common by all good men and all free men. But before we can undertake the task of rebuilding we have not only to be convinced ourselves, but we have to convince all other countries that the Nazi tyranny is going to be finally broken. The right to guide the course of world history is the noblest prize of victory. We are still toiling up the hill; we have not yet reached the crest-line of it; we cannot survey the landscape or even imagine what its condition will be when that longed-for morning comes. The task which lies before us immediately is at once more practical, more simple, and more stern. I hope—indeed, I pray—that we shall not be found unworthy of our victory if after toil and tribulation it is granted to us.

RIGHT HON. WINSTON S. CHURCHILL, *from a speech delivered to the House of Commons, August* 20, 1940

A CHARTER FOR HUMANITY

It is too early to predict what effect the Atlantic Charter will ultimately have on human history. The value of such a charter (as the Great Charter of 1215 has shown) lies not merely in the document itself but in the use which is made of it. There may be times when its clauses seem to be disregarded by particular governments or ministers. Yet in the long run it will still prove to be valuable as a symbol of man's endeavour to shape his affairs sanely and decently, and as one of the milestones on the rough path of human progress towards peace.

The Charter was the direct result of a meeting between Mr Churchill, the British Prime Minister, and President Roosevelt, the American leader. They met at sea, on board an American warship in the territorial waters of a British colony (Newfoundland)—a happy symbol of co-operation between the two great English-speaking nations. It may be that the Bay of Placentia will one day become one of the famous place-names of history, and the date of the meeting, August 9, 1941, one of those dates which no schoolboy is allowed to forget. It will, at any rate, be a date with happier and more peaceful associations than most of those which have become unforgettable.

Few of the great meetings of history have taken place under conditions so dramatic and unusual as those under which Mr Churchill and President Roosevelt came together in conference. England had for over a year been standing alone against the worst of Germany's might. She had in twelve months suffered desperate set-backs and endured terrible battle-strokes. France, her ally, had capitulated; Dunkirk had witnessed the amazing evacuation of the British army from the Continent; the whole coast-line from the north of Denmark to the south of France was in German hands, and for months invasion had seemed imminent and inevitable; for a long and fearful winter the German air force had pounded London and other great cities of the United Kingdom; the U-boat campaign was at its height, striving to blockade us into submission. America still remained outside the conflict, though she had given evidence (such as the Lease-lend Act) as to where her sympathies lay.

It was at this stage of the world conflict that Mr Churchill made up his mind to meet the American President and discuss with him not only the progress of the war, and the efforts of Britain to save herself and Europe from Nazi aggression, but also the wider aims and principles of both Britain and America, and their reactions on the rest of the world.

It was a momentous decision that Mr Churchill made. Never before in modern history had a great national leader undertaken such a journey at so critical a time in the midst of war. The Atlantic was infested with Hitler's submarines. But the importance of the conference seemed to Mr Churchill to justify the risk, and it is quite certain that he personally welcomed it. The President received a transatlantic call and learned the details of the suggested conference from the Prime Minister's own lips. He had already expressed the wish that he and Mr Churchill could meet, and he at once agreed to the suggestion.

The preparations then went forward. It was obvious that all possible secrecy must be preserved. In England this was easier than in America, where war conditions did not exist, and which was therefore not subject to censorship. Many people knew that something was afoot, but they did not know precisely what it was. Not only the Prime Minister but some Chiefs of Staff and their technical advisers were to cross the

Atlantic. Clerks, Admiralty officials, and other staff were needed. A battleship had to be prepared for the reception of the Prime Minister and his considerable train of advisers and executives. Thus a very large number of people were busily engaged in preparing for the eventful journey; but only a few of these knew the purpose of the preparations. Even after the special train had left Marylebone Station in London for the Scottish port from which the embarkation was to be made, few of the passengers had any idea of their destination. Nor did they know who was to accompany them until the train stopped at a small country station on the way, and the Prime Minister and the Chiefs of Staff entered it.

The train steamed up to Scotland, and stopped next morning at the west-coast port of Thurso. From there the party was taken by destroyer to the famous haven of Scapa Flow, where the great battleship H.M.S. *Prince of Wales*, fresh from its sinking of the *Bismark*, lay at anchor, waiting.

The officers and crew of the ship knew little of the forthcoming trip. They knew that some one was expected aboard, but not who it was. They knew they were shortly to make a trip, but not which part of the globe they were to visit. Some of them, indeed, guessed that the other side of the Atlantic was their destination and that the American President was the man whom Mr Churchill was going to meet. But few besides the captain knew this for certain.

Elsewhere rumours were spreading, especially in America. When the President set out in his yacht *Potomac* for a "fishing trip," newspaper correspondents were not allowed to follow, but were forced to remain ashore. For the first time in history the American people remained for several days ignorant of the precise whereabouts of their President. Rumours were naturally common: the President had gone ashore somewhere on the coast; Mr Churchill was absent from London; he was on Mr Roosevelt's yacht; he was flying to Washington. The State Department in Washington asked newspaper men "not to speculate," but this was too much to be expected.

Meanwhile the giant British battleship sped on through the tossing waters of the Atlantic. She was alone now in the vast ocean. The escort vessels which had at first accompanied her had lost contact during the first night, when heavy seas were running. There was small chance of their catching up with the big ship even if she reduced speed a little. So she continued to plough her lonely furrow through the waves, bearing on his way the key man of the Allied cause.

Many a U-boat commander's mouth would have watered had he known what a prey was before him. But fortune, on this occasion at least, was on the side of right. One U-boat, indeed, was reported due ahead; but the battleship temporarily altered course, and the Atlantic pest was avoided.

At last, on August 9, the great ship steamed slowly into the bay of Placentia, appropriately in the waters of Britain's oldest colony. It was a quiet setting, with hillside scenery not unlike that of the West of Scotland. Waiting in the calm waters of the bay was an inspiring group of American warships, ranging in size from the battleship *Arkansas* to the smallest destroyers. Among these impressive ships was the cruiser *Augusta*. It was on this ship that the attention of Mr Churchill and his comrades was fixed, for on the deck of the *Augusta* stood the man who had left the American shore a few days previously to go fishing. It was indeed a successful fishing excursion: the President's catch was the most distinguished man in Europe.

The Prime Minister and the American President met in an atmosphere of great cordiality, though the one led a country in the throes of war and the other a country at peace. Discussions between them and between their technical advisers took place in the President's cabin. In that cabin the two men earnestly discussed their common principles, and drew up together a charter for Humanity. The draft was gone over again and again, and so close was the collaboration that it is impossible to say who was responsible for any given part of the final outcome.

Thus was the Atlantic Charter created, step by step.

On the second day of the meeting, a Sunday, the President attended an Anglo-American church parade on the decks of the British ship. "The sun shone bright and warm," said Mr Churchill in a subsequent picture of the scene,

> "while we all sang the old hymns which are our common inheritance, and which we learned as children in our homes. . . . When I looked upon that densely packed congregation of fighting men of the same language, of the same faith, of the same fundamental laws, of the same ideals, now to a large extent of the same interests, and certainly in different degrees facing the same dangers, it swept across me that here was the only hope, but also the sure hope, of saving the world from measureless degradation."

On the Tuesday the return voyage was begun. By this time the Germans had got to know of the meeting, and the passengers and crew were warned that attack by submarine or even from the air might be expected at any time. No doubt the U-boats in the Atlantic received instructions to seek out and destroy at any cost the temporary home of the British leader who had defied German might when it was at its peak, and who now had so insouciantly chosen to travel to America by sea.

On this return journey the battleship was not alone on the ocean; there was a screen of four destroyers with her, and for part of the journey they were accompanied also by some American destroyers carrying mails to Iceland. Moreover, when they had been two days at sea they overtook a British convoy on its way from America to Britain with ammunition and supplies. It was, in the Prime Minister's words, "a noble sight." Mr Churchill's own description of it could not be bettered:

> "The whole broad horizon seemed filled with ships; seventy or eighty ships of all kinds and sizes, arranged in fourteen lines, each of which could have been drawn with a ruler; hardly a wisp of smoke, not a straggler, but all bristling with cannon and other precautions on which I need not dwell; all surrounded by their British escorting vessels, while overhead the far-reaching Catalina air-boats soared—vigilant, protecting eagles in the sky."

It is hard to say who was the more delighted at the meeting—the vessels in the convoy, informed by flag signal that Mr Churchill was passing through their midst, or the Prime Minister himself. So excited was the latter, indeed, that he persuaded the Captain of the *Prince of Wales* to turn back and pass through the convoy once more.

Since the Germans now knew that Mr Churchill was on the Atlantic there was no point in keeping the meeting any longer a secret. So on the evening of August 14, the news of the meeting and the text of the Charter which had been drawn up were broadcast to the world by the Deputy Premier, Mr Attlee, while Mr Churchill was still at sea. To the millions listening in drawing-rooms and parlours, in crowded restaurants and eating-houses, in the secret cellars of enslaved Europe, in the tiny cabins of ships tossing on the ocean—to all of these Mr Attlee spoke from a room in Downing Street.

"I have come to tell you," he said, "about an important meeting between the President of the United States and the Prime Minister, and of a declaration of principles which has been agreed between them. . . . They have agreed upon the following joint declaration:

"The President of the United States and the Prime Minister, Mr Churchill, representing His Majesty's Government in the United Kingdom, being met together, deem it right to make known certain common principles in the national policies of their respective countries on which they base their hopes for a better future for the world:

"*First*, their countries seek no aggrandisement, territorial or other.

"*Second*, they desire to see no territorial changes that do not accord with the freely expressed wishes of the peoples concerned.

"*Third*, they respect the right of all peoples to choose the form of government under which they will live; and they wish to see sovereign rights and self-government restored to those who have been forcibly deprived of them.

"*Fourth*, they will endeavour, with due respect for their existing obligations, to further the enjoyment by all States, great or small, victor or vanquished, of access, on equal terms, to the trade and to the raw materials of the world which are needed for their economic prosperity.

"*Fifth*, they desire to bring about the fullest collaboration between all nations in the economic field, with the object of securing for all improved labour standards, economic advancement, and social security.

"*Sixth*, after the final destruction of Nazi tyranny, they hope to see established a peace which will afford to all nations the means of dwelling in safety within their own boundaries, and which will afford assurance that all men in all the lands may live out their lives in freedom from fear and want.

"*Seventh*, such a peace should enable all men to traverse the high seas and oceans without hindrance.

"*Eighth*, they believe all the nations of the world, for realistic as well as spiritual reasons, must come to the abandonment of the use of force. Since no future peace can be maintained if land, sea, or air armaments continue to be employed by nations which threaten, or may threaten, aggression outside of their frontiers, they believe, pending the establishment of a wider and permanent system of general security, that the disarmament of such nations is essential. They will likewise aid and encourage all other practicable measures which will lighten for peace-loving peoples the crushing burden of armaments."

Thus was the text of the Atlantic Charter given to the world for the first time on the evening of Friday, August 14. In less than twenty-four hours it had been broadcast again in no fewer than twenty-seven languages.

Ten days later the Prime Minister broadcast to the nation a description of his meeting with President Roosevelt. In the course of his speech he summed up, in words which may become historic, the purpose and significance of the meeting and of the Charter to which the meeting gave birth.

"The meeting," Mr Churchill said,

> "was symbolic. That is its prime importance. It symbolizes in a form and manner which every one can understand, in every land and every clime, the deep underlying unities which stir and, at decisive moments, rule the English-speaking peoples throughout the world. . . .
>
> "This was a meeting which marks for ever in the pages of history the taking-up of the English-speaking nations, amid all the peril, tumult, and confusion, of the guidance of the fortunes of the broad toiling masses in all the continents, and our loyal effort, without any clog of selfish interest, to lead them forward out of the miseries into which they have been plunged, back to the broad high-road of freedom and justice. This is the highest honour and the most glorious opportunity which could ever have come to any branch of the human race."

G. F. L.

SUGGESTIONS FOR FURTHER READING

The following can be obtained in most public libraries:

Alain Gerbault: *In Quest of the Sun.*

Captain Joshua Slocum: *Sailing Alone around the World.*

G. Shairer and E. Jameson: *Heroes of British Life-boats.*

H. G. Ponting: *The Great White South.*

E. G. R. Evans: *South with Scott.*

R. Amundsen: *The South Pole.*

A. Cherry Garrard: *The Worst Journey in the World.*

R. E. Byrd: *Skyward.*

J. M. Scott: *The Land that God gave Cain.*

Martin Lindsay: *Those Greenland Days.*

F. S. Chapman: *Watkins' Last Expedition.*

Edward Whymper: *Scrambles amongst the Alps.*

F. S. Smythe: *An Alpine Journey.*

R. L. G. Irving: *Ten Great Mountains.*

Sir Francis Younghusband: *The Epic of Mount Everest.*

Hugh Ruttledge: *Everest* 1933.

Irene Cooper Willis: *Florence Nightingale.*

Martin Gumpert: *Durant.*

Patrick Pringle: *The Romance of Medical Science.*

Eleanor Doorly: *The Radium Woman.*

Fernand Gigon: *Epic of the Red Cross.*

John Farrow: *Damien the Leper.*

Albert Schweitzer: *On the Edge of the Primeval Forest.*

Wilfrid Grenfell: *A Labrador Doctor.*

T. Howard Somervell: *After Everest.*

JOHN HAYWARD: *The Romance of Medicine.*
F. C. KELLY: *The Wright Brothers.*
WINSTON S. CHURCHILL: *Into Battle.*
COLONEL PRETORIUS: *Jungle Man.*
SIR LEONARD WOOLLY: *Digging up the Past.*
EVELYN CHEESEMAN: *Six-legged Snakes in New Guinea.*
J. R. ACKERLEY: *Hindu Holiday.*
NORA WALN: *The House of Exile.*
FRANCIS PARKMAN: *The Oregon Trading.*

QUESTIONS AND EXERCISES

SALVAGE IN MID-ATLANTIC

1. Describe in your own words the appearance presented by *San Demetrio* when the men first boarded her.

2. Which do you consider the most formidable task that the men had to face in their salvage exploit ?

3. Say whether the following statements are true, untrue, or uncertain, forming your decision on information given in the extract, and quoting page and line references :

(*a*) There was no accommodation on board.
(*b*) The boat's crew burned orange-coloured flares to attract attention.
(*c*) Mr Pollard was the Chief Engineer.
(*d*) The Paxman generator was being overhauled when the ship was attacked.
(*e*) All damage to the ship was above the water-line.

4. Suppose *San Demetrio* had blown up just as the men were approaching her. Tell the story in your own way.

ALONE IN THE ATLANTIC

1. Give an instance of Gerbault's presence of mind.

2. Show how Gerbault's seamanship and sailing experience enabled him to survive the storms he encountered.

3. Explain the following : 'the seas were running high'; 'making the port of missing ships'; 'away to leeward'; 'on the starboard tack'; 'as the crow flies'; 'lashing the tiller.'

4. Write a short poem in praise of the *Firecrest*, using any metre you please. (You may be helped by reading John Masefield's *Sea Fever* or Cunningham's 'A wet sheet and a flowing sea.' They may both be found in the *Golden Treasury with Additional Poems*.)

5. Draw a 40-foot single-masted cutter, marking the following : jib, boom, gaff bowsprit, bobstay, shrouds.

THE RED CROSS OF THE SEA

1. To what principle in life-boat design did Wouldhave attach most importance? How far did the "Gentlemen of the Lawe House" approve of his design?

2. Draw a sketch of a modern life-boat.

3. Make a list of names connected with the life-boat service as they are mentioned in this extract. Add five more names from any other source, and state what you know about them.

4. Give in your own words the substance of the extracts from Hillary's *Appeal.* (Your answer should be from 100-150 words.)

5. Write a story about a life-boat rescue.

LIFE-BOATS IN WAR-TIME

1. Suggest some ways in which war conditions make the work of the life-boat service more difficult.

2. Justify the use of the term 'superb seamanship and courage' as applied to the Haisborough Sands rescues.

3. Write down five episodes from this extract in the order in which they have impressed you most.

4. Imagine you were a seaman in the steamer stranded on Hammond Knoll. Tell the story of what you saw.

5. Make a list of various activities which life-boats have been called upon to perform in war-time.

TWO MEN IN AFRICA

1. What difficulties did Livingstone have to contend with on his great journey?

2. Draw a sketch-map of Livingstone's journey from Capetown to Loanda, *via* Linyanti. Put in the names of any other places you can find which are mentioned in this extract.

3. Write down ten questions that you would like to ask Livingstone if you found yourself face to face with him.

4. Imagine that you find yourself standing side by side with some other famous person of the past. Write an account of your conversation with him.

5. Find out what you can about the abolition of the slave trade by Great Britain and America. Make a short list of notable names connected with Abolition, with a brief note on each.

VERY GALLANT GENTLEMEN

1. What misfortunes dogged Scott and his party?
2. Give examples from Scott's diary of the explorers' courage.
3. Draw a sketch-map of the explorers' route.
4. Tell the story of Oates as simply as you can.
5. Write an essay on one of the following:
    (*a*) Polar Exploration.
    (*b*) The Hero I Most Admire.
    (*c*) Diaries.

WINGS OVER THE SOUTH POLE

1. What was the name of the plane which flew over the Pole? Why was it so called?

2. Give the names and individual duties of its crew.

3. Discuss the points which Byrd had to consider when it became necessary to lighten the plane. Say whether you agree with his decision, giving a reason.

4. Byrd's crisp style is well suited to such an account as this. Quote a paragraph which illustrates the effective use of the short sentence in describing a dramatic situation.

5. Write a short report of the flight as you imagine one of the crew might have told it to a newspaper reporter.

THE STORY OF GINO WATKINS

1. Draw a map of Greenland, marking the various journeys made by Watkins and his companions.

2. Make a list of the members of Watkins' first expedition to Greenland.

3. What qualities of Watkins are revealed in this extract?

4. What difficulties did Watkins and his party meet with on the coastal journey around the south of Greenland?

5. Write a short article on Watkins, suitable for a school or form magazine, illustrating it in any way you like.

ACHIEVEMENT IN THE ALPS

1. By exact reference, justify the inclusion of this extract in the book on the grounds of (*a*) courage, (*b*) determination, (*c*) endurance.

2. Write a paragraph beginning, "The human hand is a miracle of constructive art."

3. Explain the following words: reconnaissance; *arête*; amphitheatre; colossal; granule.

4. Find out what you can about Faraday's discovery in 1846.

5. Write an essay on one of the following:
   (*a*) The Lure of the Mountains.
   (*b*) The Alps.
   (*c*) Famous Mountain Peaks.

MAN AGAINST MOUNTAIN

1. Make a brief diary in note-form of Mallory and Irvine's progress during the ascent of Everest, as far as this is known.

2. What elements of heroism are there in this extract?

3. Tell the story of Mallory and Irvine's attempt in your own words.

4. At what altitudes were the following situated: Snowfield Camp; Highest Bivouac; Ice Cliff Camp?

5. Find out what you can about other Everest expeditions, and make a list of them.

THE LADY OF SCUTARI

1. Write down briefly the four chief deficiencies in the treatment of the Crimean wounded.

2. Give three examples of official red-tape at Scutari.

3. Lytton Strachey was an author noted for his effective use of irony. Quote three examples.

4. Find out what you can about the reforms inspired by Miss Nightingale after her return from Scutari to England.

5. Write a scene, in dramatic form, in which Florence Nightingale carries out her reforms at Scutari.

HUMANITY AND WAR

✓ 1. Divide this extract into five or six sections, indicating where you would begin each section and giving it a title. (The sections need not be of equal length.)

2. Explain with reference to the context: nucleus; battle of Dettingen; Maltese Cross; the Crusades: *zouave*.

3. Tell the story of the Red Cross in about 250 words.

4. Discuss the actions of the Americans at St Malo.

THE HERO OF MOLOKAI

1. Draw a map of the Sandwich Islands.

2. Suggest how Father Damien's physical strength may have helped him in his self-appointed tasks.

3. Give the meaning of the following: incipient; evangelize; segregate; domicile; requisition.

4. Write a short defence of Father Damien in reply to a criticism asserting that he did not deserve the praise offered to his memory. (Such a criticism was actually made by a clergyman named Hyde, and drew from R. L. Stevenson, who had visited Molokai after Damien's death, a famous reply blazing with indignation and irony.)

5. Do you consider that the discovery of the Sandwich Islands by white men has on the whole been a benefit to the natives? Give reasons for your reply.

THE LONE DOCTOR

✓ 1. Draw a map of French Equatorial Africa, and mark the chief places mentioned in this extract.

2. What evidence can you offer to indicate that Schweitzer is tolerant and broad-minded?

3. Are there any traces of humour in this extract? If so, quote them.

4. What difficulties did Schweitzer have to contend with?

5. Find out what you can about other medical men, such as Grenfell, Somervell, and Seagrave, who have done pioneer work in medicine among native peoples.

THE FIGHT AGAINST HYDROPHOBIA

1. Write a letter from Jupille to a friend, telling the story of his experiences.

2. Tell the same story as it might be told in a newspaper. (The editor has space for only 150 words.)

3. Although he carried out many experiments on animals Pasteur was said to be very tender-hearted, and always insisted that as little pain as possible should be caused by his experiments. Is there any evidence in this extract to suggest his tender-heartedness? If so, give references.

4. Find out the names of other scientists distinguished for their studies in bacteriology, and write brief notes on them.

5. Put into the form of scenes from a play the episodes where Pasteur is consulted by Vone and Madame Meister, and where Pasteur consults Vulpian and Grancher on the case.

THE FATHER OF MODERN SURGERY

1. Write an imaginary dialogue between two sixteenth-century surgeons, in which one explains to the other the details of Paré's discovery.

2. Give a brief character sketch of Lister.

3. Explain the meaning of the following: putrid exhalations; infected fabric; a few decades previously; enthusiastic following; malpractice.

4. Write a letter from an enthusiastic student of Lister at Edinburgh to a medical friend in London.

5. Find out what you can about (*a*) Simpson's discovery of anæsthetics and (*b*) a modern discovery (*e.g.* penicillin), and write brief notes on them.

THE CONQUEST OF MALARIA

1. Make a 'roll call of honour' of those, named and unnamed, who have deserved well of humanity by their splendid work in helping to solve the problem of malarial disease.

2. Suggest from this extract how science has benefited humanity.

3. For the August issue of a school or form magazine write an article of 200 words entitled 'Mosquito Day.'

4. Find out what you can about the Nobel Prizes.

5. Write an essay on one of the following:

   (*a*) 'Patience is a virtue.'
   (*b*) Science and medicine.
   (*c*) Insects.

HEROES OF HAVANA

1. How was it that when Dr Finlay allowed infected mosquitoes to bite healthy people, these failed to catch the disease of yellow fever?

2. Write a letter to a newspaper criticizing the government grant of 15 shillings a week to Kissinger, and advocating a reward more in accordance with the value of his work to society. Make your letter persuasive rather than abusive.

3. Put the following words in sentences of your own: niggardly; transmit; parasite; exchequer; contagious; agitation; exhibition; impenetrable; alleviate; inertia.

4. Draw a sketch-map of Central America, including Panama and Cuba.

THE BLIND ROAD-MAKER

1. Describe in 100 words Metcalf's work in building the Huddersfield to Manchester road.

2. Give the names of other blind men and women who have triumphed over their disability, and state briefly how they have so triumphed.

3. Describe briefly how roads are made to-day.

4. Write a story about a lost land in which all the inhabitants are blind, and which is accidentally discovered by a man with the gift of sight, who is regarded by the inhabitants as suffering from an abnormality; they therefore try to cure him by putting out his eyes. (When you have written your story read *The Country of the Blind*, by H. G. Wells.)

5. Write an essay on one of the following:

(*a*) Roads.
(*b*) The courage of the blind.
(*c*) Transport yesterday and to-day.

THE BIRTH OF THE AEROPLANE

1. What difficulties did the Wrights meet with in the course of their experiments?

2. Tell the story of the progress of the Wrights in aeronautics, illustrating your work if possible.

3. Find out what you can about the work of the pioneers of flight, and describe briefly what you have discovered.

4. Tell briefly the "tale of man's triumphs over his natural surroundings."

5. Describe and illustrate any modern type of aeroplane.

FIRST ATLANTIC FLIGHT

1. Pick out any metaphors used in this extract which appear to have been drawn from ships or the sea.

2. Explain: dead reckoning; aileron; Very lights, sextant; Pole star.

3. Say whether the following statements are true, untrue, or

uncertain, forming your decision on information given in this extract, and quoting page and line references:

(*a*) Alcock and Brown were the first airmen to fly from Newfoundland to Europe.

(*b*) At one period they reached a height of over two miles above the sea.

(*c*) Their first misfortune involved the failure of the wireless.

(*d*) During the flight the airmen looped the loop.

(*e*) The wind helped them all the way.

4. Write an essay on 'Atlantic Flights' or 'Heroes of Flight.'

5. Describe the difference between a modern air liner and the Vickers 'Vimy' in which Alcock and Brown made their flight.

COURAGE IN THE AIR

1. Make a report on this exploit as the squadron-leader pilot might have written it.

2. Quote three examples of understatement in the sergeant-pilot's account.

3. Write a conversation between the author of the account and Joe, the navigator, as it might have taken place (*a*) before, and (*b*) after the exploit.

4. Pick out what you consider the three most dramatic episodes of the account, and give a title to each.

THE FIRST STRATOSPHERE ASCENT

1. In what ways did the stratonauts experience (*a*) good luck and (*b*) bad luck?

2. Write down brief notes, suitable for the Stop Press column of a newspaper, for the following times on May 27: 3.30 A.M.; 4 A.M.; 4.30 A.M.; 2 P.M.; 7 P.M.; 7.45 P.M.; 9 P.M.

3. Give the words used in this extract to express the following ideas: grew less; for the time being; keep safe for future use; a lengthening in time; capable of being estimated.

4. Suppose you are the Special Correspondent at Innsbruck of a London daily paper. Write a short article (about 150 words) announcing the safe landing of the stratonauts.

5. Write a story in which two characters secretly enter a balloon which is waiting to make a stratosphere ascent. They suddenly find that it has been accidentally released while they are still in it

ALONE IN THE BREACH

1. Mention two points which suggest that this extract was intended to be spoken.

2. What examples can you find of (*a*) irony, (*b*) emphatic repetition, (*c*) alliteration?

3. Explain the following words or phrases as used in the extract: the U-boats are contained; plutocratic; veracity of statement; the western seaboard; incredible.

4. Select five phrases which appeal to you as being particularly effective, and add a comment on each.

5. Describe briefly the respective parts played by the Navy and the Air Force in warding off Hitler's threatened invasion in 1940.

A CHARTER FOR HUMANITY

1. Summarize in 100 words the eight points of the Atlantic Charter.

2. What do you consider the most dramatic moment in the story of the making of the charter?

3. Which do you think the most important of the charter's clauses? Give a reason.

4. Write brief notes on: the Charter of 1215; the Lease-lend Act; Downing Street; Scapa Flow.

5. Write an article on 'Anglo-American Co-operation' or 'The Crushing Burden of Armaments.'

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